REQUEST FOR QUALIFICATIONS

Teton County, Idaho will accept Statements of Qualifications, identified on the envelope, for the supply of:

BRIDGE CONSTRUCTION AND STREAM STABILIZATION

The County of Teton in the State of Idaho ("County") is soliciting responses to a Request for Qualifications (RFQ). The County will accept separate sealed Statement of Qualifications (SOQ) for the replacement of a bridge across W3000N over Badger Creek and stream stabilization upstream and downstream of the bridge. The purpose of this RFQ is to establish a list of qualified applicants eligible to participate in the preparation and submission of bids for construction of the project and to rank the qualified applicants.

The Bid Requirements and specifications will be available May 30, 2013, at the Teton County Recorder's Office at 150 Courthouse Drive, Driggs, Idaho, 208-354-0245. Electronic copies of the Qualification Requirements and ranking criteria will be posted on the County Website: www.tetoncountyidaho.gov. The deadline for submitting the responses (SOQ) is June 13, 2013 at 10:00 am local time.

The contractor shall comply with all fair labor practices and must meet the requirements of State statutes. No SOQ may be withdrawn after the scheduled time for the public opening of the bids specified above.

The County reserves the right to reject any or all SOQs received, to waive informalities, to postpone the award of the contract for a period of not to exceed sixty (60) days, and to accept the SOQ which is in the best interest of Teton County.

REQUEST FOR QUALIFICATIONS
BRIDGE CONSTRUCTION & STREAM STABILIZATION

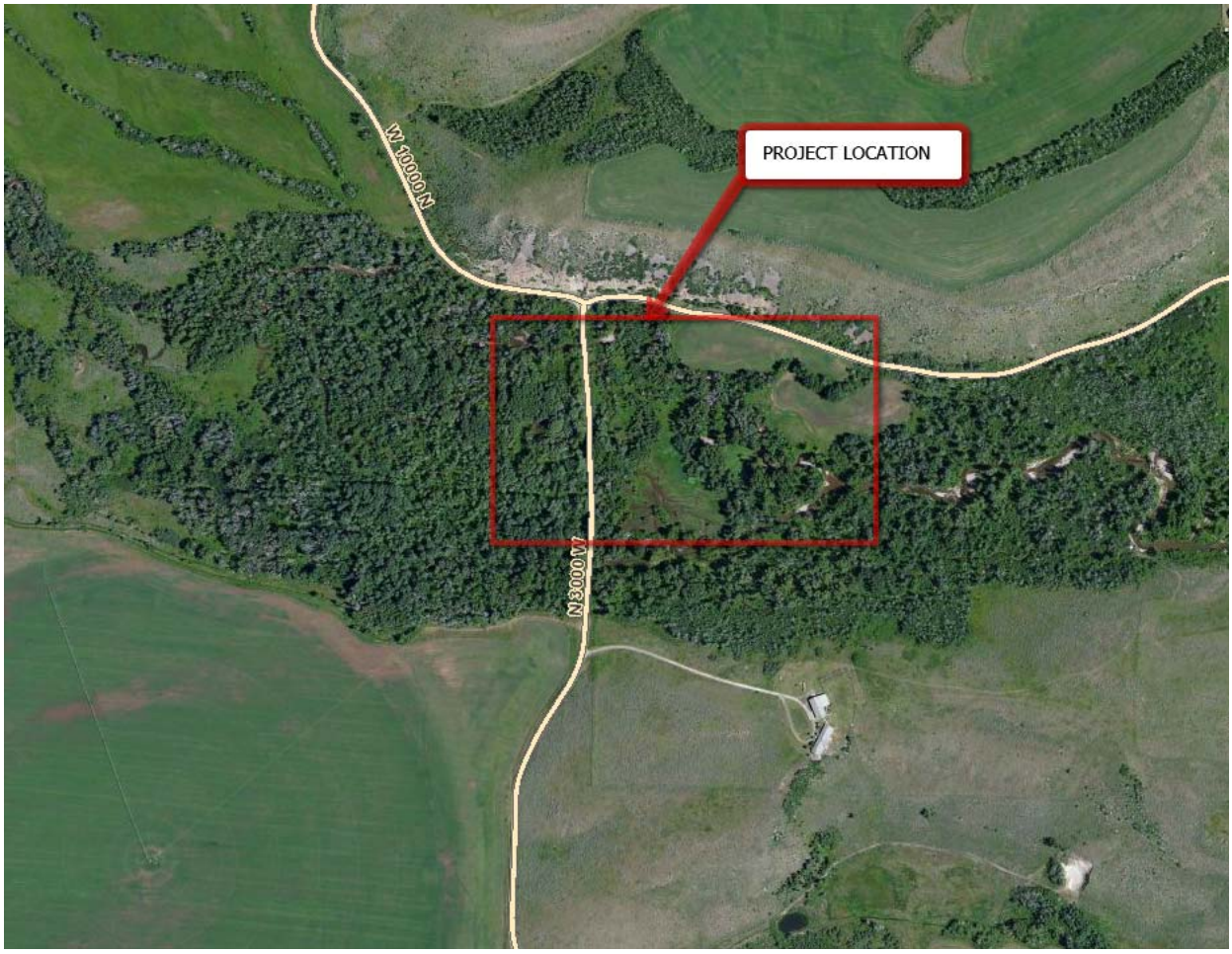
1) PURPOSE OF REQUEST

i) The County of Teton in the State of Idaho ("County") is soliciting responses to this Request for Qualifications (RFQ). This response, or Statements of Qualifications (SOQ), will be to pre-qualify contractors/contractor teams for the construction of the N3000W bridge and stream stabilization of Badger Creek, pursuant to Title 67, Chapter 2805(3)(b).

ii) The purpose of this Request for Qualifications (RFQ) is to establish a list of qualified applicants eligible to participate in the preparation and submission of bids for construction and to rank the qualified applicants. Eligibility and ranking criteria will be based on the firm's qualifications, capabilities and experience as demonstrated by satisfactory completion of similar projects that involved the specific types of construction techniques identified below.

2) PROJECT LOCATION:

The project is located at N3000W and Badger Creek.



3) TIME SCHEDULE

i) The County will follow the following general timetable:
   (a) Issue RFQ May 30, 2013
   (b) Deadline for Submittal of Responses to RFQ
      (i) The deadline for submitting the responses (SOQ) is at June 13, 2013 at 10:00 am local time.
      (ii) The SOQ OPENING will occur at the Teton County Engineering Office, Thursday June 13, 2013 at 10:15 am local time

4) INSTRUCTIONS TO PROPOSERS

i) All responses shall be sent to:
   Jay Mazalewski / County Engineer
   Teton County
   150 Courthouse Drive
   Driggs, ID 83422
   (208) 354-0245
   Or hand delivered to the County Clerk/Recorder office at 150 Courthouse Drive, Driggs, Idaho.

ii) Please place five (5) copies of your SOQ in a sealed envelope and clearly label "SOQ for Bridge Reconstruction & Stream Stabilization" and the name of the respondent.

iii) Qualifications should be prepared simply and economically, providing a straight forward, concise description of provider capabilities to satisfy the requirements of the request. Emphasis should be on completeness and clarity of content. Use of both sides of paper sheets for any submittals to the County is desirable whenever practicable.

iv) An authorized representative of the firm must complete and sign at least one (1) original of its SOQ, certifying the truth of the statements and representations made in the SOQ. This can be addressed in the cover letter.

v) Any questions concerning the County's RFQ process shall be directed to Jay Mazalewski / County Engineer at (208) 354-0245 or emailed to jmaz@co.teton.id.us.
   (See section 6)

vi) Required information: To be selected, a Statement of Qualifications must demonstrate that the Respondent is highly qualified by expertise and experience to perform the Services. A Statement of Qualifications should emphasize the Respondent's qualifications and experience regarding all aspects of the Services. At a minimum, all of the following information MUST be furnished by each Respondent as part of its Statement of Qualifications. The information provided must be complete and accurate. Any omission, inaccuracy, or misstatement may be cause for rejection of the Proposal.

1) Cover Letter: letter should introduce your team, identify the single point of contact, and provide the contact telephone number and address of the project manager. This letter should include a statement committing the personnel and resources identified in the proposer's submittal. It should also include:
   a. Full, correct legal name and type of business entity.
   b. Address (street and mailing)
   c. Name of respondent's representative for purposes of notice or other communications regarding the RFQ.
   d. Telephone, Facsimile numbers and email addresses of the office and the representative.
2) Provide an organizational chart including any subcontractors and their role in the project.

3) Please list name(s) of the person you will be designating as foreman for this project and all equipment operators along with their individual experience and number of years performing similar work. Include only those individuals that will actually be working on this project. List all relevant professional licenses, degrees and training for each of your company employees.
4) Provide a general overview of your company's experience in bridge construction projects.
5) Provide a general overview of your company's experience in stream restoration implementation.
6) Provide detailed information for at least five projects your company has completed that are relevant to this project. Include project costs and descriptions.
7) Describe your companies past experience installing structures that will be used for this project.
8) Please list the equipment that you will use for project construction. If your company will need additional equipment, describe how you intend to acquire said equipment.
9) State your company's Public Works Certification class, type and category.
10) Describe the ability of your company to obtain Bid, Performance and Payment Bonds in the amount equal to 5%, 100%, and 100% respectively and the amount of bonding your company can provide for this project
11) Please provide three references who have worked with you in the past five years. If you will be using subcontractors, provide three references for each subcontractor.
12) Describe your ability to complete this project with prior to the 2014 runoff season.
13) Familiarity and knowledge of local streams and hydrology.

5) SELECTION CRITERIA/PROCESS

a) A Scoring committee will be formed consisting of three to five people from the County and the design team. Each component of the qualifications package will be evaluated based on the information in the Scoring Table and this RFQ.
b) All scores will be totaled and returned to the Board of County Commissioners within 30 days of SOQ opening.
c) The Board of County Commissioners will select, at a timeline of their choosing, the most qualified firm on the basis of demonstrated competence and qualifications for the type of professional services required.
d) All firms/teams who submit SOQs will be notified of the Board of County Commissioners choice.
e) Final approval of any selected firms/teams is subject to the action of the Board of County Commissioners.

SCORING TABLE			
Criteria		**Available Score**	**Score**
1	Cover Letter	1 = complies with req. 0 = does not comply	
2	Organizational Chart	0 to 2, where 2 is highest score	
3	Foreman & Crew	0 to 2, where 2 is highest score	
4	Bridge Experience	0 to 2, where 2 is highest score	
5	Steam Restoration Experience	0 to 2, where 2 is highest score	
6	Relevant Projects	0 to 2, where 2 is highest score	
7	Relevant Stream Structure Installation	0 to 2, where 2 is highest	

		score	
8	Equipment	0 to 2, where 2 is highest score	
9	Public Works Licensure	0 to 2, where 2 is highest score	
10	Bid/Performance/Payment Bonding	0 to 2, where 2 is highest score	
11	References	0 to 2, where 2 is highest score	
12	Timeline	0 to 2, where 2 is highest score	
13	Local Stream Knowledge	0 to 2, where 2 is highest score	
		Total:	

A minimum of 15 points is required. However, meeting the minimum points does not guarantee pre-qualification.

6) TERMS AND CONDITIONS

a) The County reserves the right to reject any and all responses, and to waive minor irregularities in any RFQ responses.

b) The opening of any RFQ response does not constitute acceptance of such respondent as a responsible, qualified respondent.

c) The County reserves the right to request clarification of information submitted, and to request additional information from any consultant.

d) Any RFQ response may be withdrawn up until the date and time set above for opening of the RFQ responses.

e) The County reserves the right, in its sole discretion, to reject any and all Statements of Qualifications and to waive any technicality, informality or irregularity in any Statement of Qualifications received for any reason at any time prior to entering into a contract to perform the Services. Without limiting the foregoing, the County specifically reserves the right to reject a Statement of Qualifications if the Respondent fails to furnish the data required by this RFQ or if the Statement of Qualifications is in any way incomplete or irregular.

f) The County shall not be responsible for any costs incurred by the firm in preparing, submitting or presenting its response to the RFQ.

g) Firms and teams may submit written questions concerning this RFQ to the Contact Person for receipt no later than 5:00 PM local time on June 7, 2013. Questions may be submitted to Jay Mazalewski via email to jmaz@co.teton.id.us or by facsimile at (208)354-8778. Questions received after the stated deadline will not be answered. No oral statement of any person shall modify or otherwise change or affect the terms, conditions or specifications stated in the RFQ, and changes to the RFQ, if any, shall be made in writing only and issued in the form of an Addendum to the RFQ and highlighted in the RFQ. All addenda will be sent to the prospective consultants.

7) PROPOSED SCOPE OF SERVICES

The N3000W Bridge Replacement and Stream Stabilization project will generally consist of the removal of the existing bridge, construction of the new bridge, and stream stabilization upstream and downstream of N3000W. The design plans are attached to this RFQ. An anticipated scope of services is outline below:

1) Establish erosion control measures.
2) Establish traffic safety measures.
3) Remove & dispose of the existing W3000N Badger Creek Bridge.
4) Coordinate with the bridge design engineer.
5) Construction Staking.
6) Deliver and install new pre-cast concrete bridge as specified (purchase by Teton County).
7) Backfill, compact & grade abutments and restore roadway as shown.
8) Coordinate with the stream restoration designer.
9) Procure materials necessary for the installation of stream stabilization structures including; rock cross vane, rock j-hook, rock barb, root wad revetment.
10) Installation of stream stabilization structures
11) Removal of stream channel gravel.
12) Shaping of stream channel.
13) Installing re-vegetation and seeding

8) COMPENSATION

a) At the designated time and date as shown in the Advertisement for RFQs, the County Engineering will open the RFQ applications for evaluation. The RFQs will be opened in public and reviewed in private. The Evaluation Committee will determine whether applicants are either "qualified" or "not qualified" to be a qualified contractor. The decision shall be final and conclusive. Firms that are named as qualified to perform will be placed on a listing as a qualified firm for one year. Denial of qualification shall not be the basis for any monetary claim or action for injunctive relief against the Evaluation Committee. In determining whether an applicant should be qualified, the Committee, in its sole and absolute discretion, will decide whether the applicant is capable of fully performing the contractual requirements for the project, in all respects.

b) Estimated contract will range from $100,000 to $150,000.

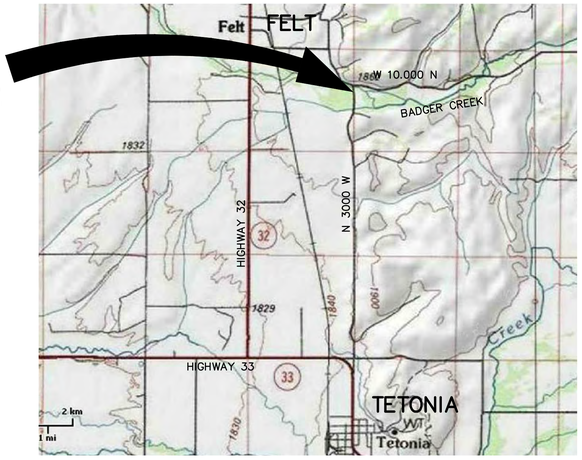
N 3000 W BADGER CREEK BRIDGE & CHANNEL RESTORATION

CONSTRUCTION DRAWINGS

(BID SET) APRIL 5, 2013

INDEX OF DRAWINGS

PROJECT SITE



VICINITY MAP

NOT TO SCALE

LEGEND

- EXISTING MAJOR CONTOUR (6110)
- EXISTING MINOR CONTOUR (6111)
- EXISTING EDGE OF GRAVEL ROAD
- EXISTING RIGHT OF WAY
- PROPOSED MAJOR CONTOUR (6115)
- PROPOSED MINOR CONTOUR (6114)
- PROPOSED GRAVEL ROAD (TRAVELWAY)
- PROPOSED GRAVEL SHOULDER
- PROPOSED RIPRAP
- PROPOSED SILT FENCE (SF)

CALL BEFORE YOU DIG
ONE CALL CENTER OF IDAHO
1-800-342-1585
CALL 2-BUSINESS DAYS IN ADVANCE BEFORE YOU DIG, GRADE, OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES.

CIVIL ENGINEER:
HARMONY DESIGN & ENGINEERING
110 E. LITTLE AVENUE
DRIGGS, ID 83422
208-354-1331

SURVEYOR:
JORGENSEN ASSOCIATES, PC
P.O. BOX 9550
1315 S. HWY 89, SUITE 203
JACKSON, WY 83002
307-733-5187

ENVIRONMENTAL CONSULTANT:
BIOTA RESEARCH AND CONSULTING, INC.
P.O. BOX 8578
140 E. BROADWAY, SUITE 23
JACKSON, WY 83002
307-733-4216

NOTE: ALL SCALES INDICATED ARE FOR 24" X 36" PLOTTED SHEETS

HARMONY
DESIGN & ENGINEERING
110 E. LITTLE AVE. • DRIGGS ID. 83422
T 208.354.1331 F 208.354.1332

DATE: 4-5-2013 (BID SET)
REVISIONS:

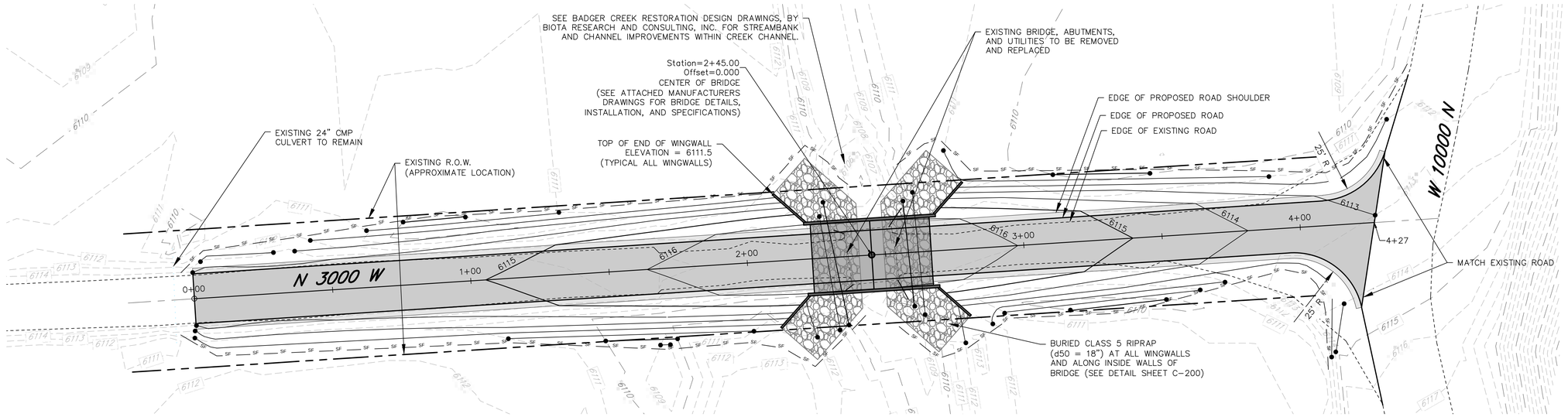
PROFESSIONAL REGISTERED ENGINEER STATE OF IDAHO 11330 JENNIFER P. YOUNG

SCALE: AS SHOWN
DESIGNED BY: RGB
DRAWN BY: RGB
CHECKED BY: JPZ
PROJ. #: 11002

PROJECT NAME
N 3000 W BADGER CREEK BRIDGE
TETON COUNTY, IDAHO

COVER SHEET

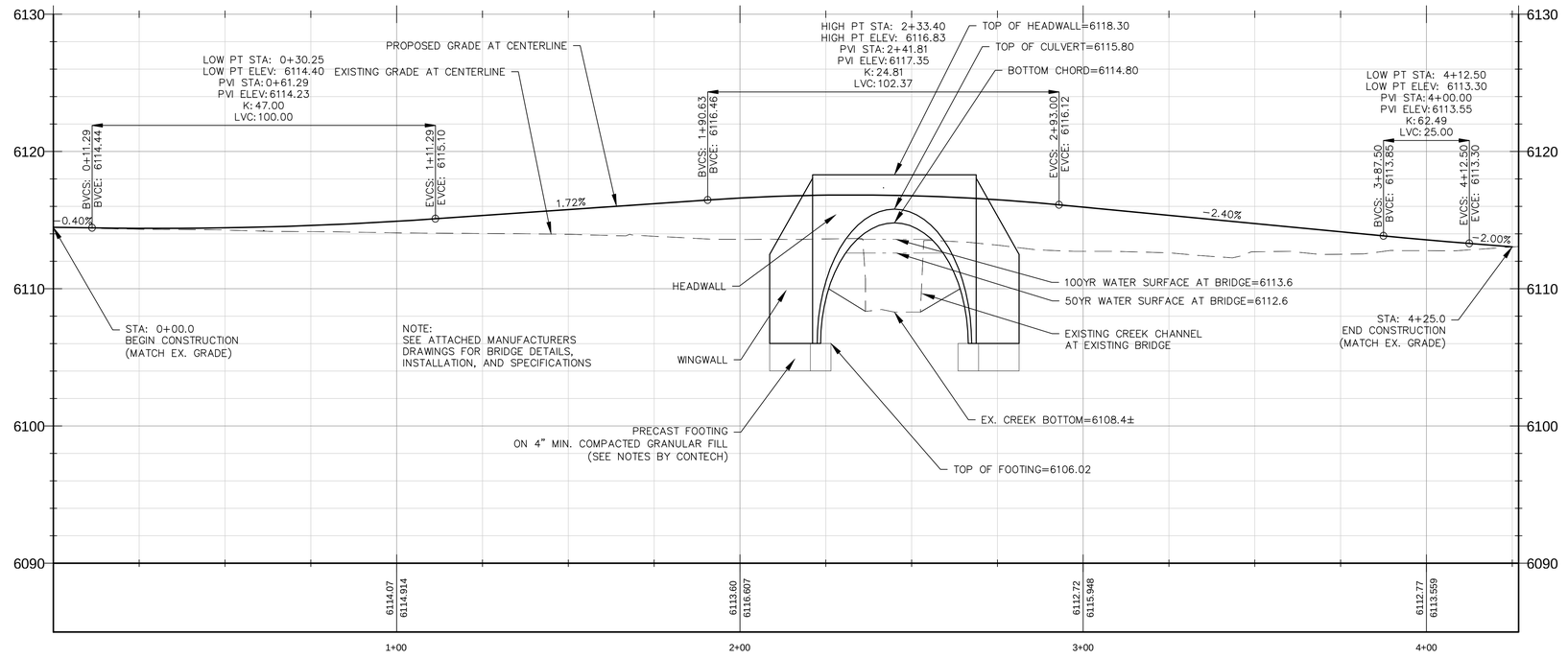
SHEET #
C-001



N 3000 W - PLAN

20 10 0 20 40

SCALE: 1" = 20'



N 3000 W - PROFILE

20 10 0 20 40

HORIZONTAL SCALE: 1" = 20'
VERTICAL SCALE: 1" = 5'

NOTE: ALL SCALES INDICATED ARE FOR 24" X 36" PLOTTED SHEETS

HARMONY
DESIGN & ENGINEERING
110 E. LITTLE AVE. • DRIGGS ID. 83422
T 208.354.1331 F 208.354.1332

DATE: 4-5-2013 (BID SET)

REVISIONS:

PROFESSIONAL ENGINEER — 11339 — STATE OF IDAHO — JENNIFER P. GRUNING

SCALE: AS SHOWN	**DESIGNED BY:** RGB	**DRAWN BY:** RGB	**CHECKED BY:** JPZ	**PROJ. #:** 11002

PROJECT NAME

N 3000 W BADGER CREEK BRIDGE
TETON COUNTY, IDAHO

ROADWAY AND CULVERT PLAN AND PROFILE

SHEET #

C-100

GENERAL NOTES

1. THE CONTRACTOR SHALL CONTACT "DIG LINE, INC." (PHONE 1-800-342-1585) FOR THE MARKING OF UNDERGROUND UTILITIES AT LEAST 48 HOURS PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL ACCEPT FULL RESPONSIBILITY AND TAKE PRECAUTIONARY MEASURES TO PROTECT ALL UTILITY LINES SHOWN AND OTHER UTILITY LINES OTHERWISE LOCATED.
2. THE INFORMATION SHOWN ON THESE DRAWINGS CONCERNING TYPE AND LOCATION OF UNDERGROUND AND OTHER UTILITIES IS NOT GUARANTEED TO BE ACCURATE OR ALL INCLUSIVE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CONTACTING THE AFFECTED UTILITY COMPANY AND THE COORDINATION OF ALL WORK IN THE PROXIMITY OF THE UTILITIES.
3. THE CONTRACTOR SHALL VERIFY LOCATIONS OF ALL EXISTING UTILITIES AND ALL DIMENSIONS IN THE FIELD AND SHALL REPORT ANY VARIATIONS OR DISCREPANCIES TO THE OWNER AND THE ENGINEER PRIOR TO PROCEEDING WITH RELATED CONSTRUCTION.
4. ALL CONNECTIONS TO EXISTING UTILITIES SHALL BE DONE IN A WAY SO AS TO MINIMIZE DISRUPTION IN SERVICE TO EXISTING USERS.
5. THE CONTRACTOR SHALL BE RESPONSIBLE FOR RESTORING ALL EXISTING ROAD AND DRIVEWAY SURFACES AND RELATED STRUCTURES TO ORIGINAL CONDITIONS (OR BETTER) AND GRADES, UNLESS DESIGNATED OTHERWISE ON THE DRAWINGS. THE OWNER OR OWNER'S REPRESENTATIVE AND THE CONTRACTOR SHALL TOGETHER COORDINATE THE DOCUMENTATION OF EXISTING GRADES AND OTHER INFORMATION PRIOR TO ALL CONSTRUCTION ACTIVITIES.
6. THE CONTRACTOR SHALL HAVE A COMPLETE AND UPDATED SET OF ENGINEERING CONSTRUCTION DRAWINGS AND ANY REQUIRED PERMITS ON SITE AT ALL TIMES. IF NO PLANS ARE ON THE PROJECT SITE, CONSTRUCTION ACTIVITIES MAY BE HALTED AT THE DISCRETION OF THE OWNER.
7. BEFORE WORK BEGINS, THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS AND MUST NOTIFY THE REQUIRED PARTIES AT LEAST 24 HOURS IN ADVANCE OF COMMENCING CONSTRUCTION ACTIVITIES.
8. ALL SURPLUS MATERIAL, TOOLS, AND TEMPORARY STRUCTURES, FURNISHED BY THE CONTRACTOR, SHALL BE REMOVED FROM THE PROJECT SITE BY THE CONTRACTOR. ALL DEBRIS AND RUBBISH CAUSED BY THE OPERATIONS OF THE CONTRACTOR SHALL BE REMOVED, AND THE AREA OCCUPIED DURING CONSTRUCTION ACTIVITIES SHALL BE RESTORED TO ITS ORIGINAL CONDITION, WITHIN 48 HOURS OF PROJECT COMPLETION.
9. ALL ROAD CONSTRUCTION SHALL CONFORM TO THE THE TETON COUNTY HIGHWAY AND STREET GUIDELINES FOR DESIGN AND CONSTRUCTION AND THE IDAHO STANDARDS FOR PUBLIC WORKS CONSTRUCTION (ISPWC-2007) AS AMENDED. THE CONTRACTOR IS REQUIRED TO MAINTAIN A COPY OF EACH STANDARD ON THE JOB SITE WHILE WORK IS BEING PERFORMED. IN CASES OF CONFLICT BETWEEN THE STANDARDS, THE CONTRACTOR SHALL FOLLOW THE TETON COUNTY STANDARDS FIRST.
10. EXISTING TOPOGRAPHIC DATA SHOWN ON THESE DRAWINGS IS FROM THE TOPOGRAPHIC SURVEY OF "BADGER CREEK BRIDGE N 3000 W COUNTY ROAD 10000N" BY JORGENSEN ASSOCIATES. P.C., DATED DECEMBER 14, 2012. VERTICAL DATUM NAVD 88.
11. ALL SUB-GRADE AND ROAD AGGREGATES SHALL BE COMPACTED TO A MINIMUM OF 95% OF MAXIMUM DENSITY, AS DETERMINED BY ASTM D698. EXISTING IN PLACE SOILS THAT ARE TO BE USED FOR SUB-GRADE SHALL BE SCARIFIED TO A DEPTH OF 6" (INCHES) AND THEN SHALL BE RECOMPACTED TO THE ABOVE REFERENCED DENSITY. ALL EXISTING VEGETATION AND TOPSOIL MUST BE STRIPPED PRIOR TO SUB-GRADE SCARIFICATION AND RECOMPACTION.
12. THE CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL LAWS, RULES, REGULATIONS AND SAFETY CODES IN THE CONSTRUCTION OF ALL IMPROVEMENTS.
13. EXCAVATIONS SHALL BE ADEQUATELY SHORED AND BRACED TO PREVENT COLLAPSE.
14. TOPSOIL, VEGETATION, AND UNSTABLE OR FROZEN SOIL SHALL BE REMOVED PRIOR TO CONSTRUCTING STRUCTURES OR EMBANKMENTS.
15. SEE BRIDGE INSTALLATION NOTES BY CONTECH FOR ADDITIONAL BACKFILL AND COMPACTION REQUIREMENTS.

EROSION CONTROL NOTES

1. TO THE EXTENT PRACTICABLE, EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSTALLED PRIOR TO GRADING ACTIVITIES. AT ALL TIMES DURING PROJECT CONSTRUCTION, ALL TEMPORARY AND PERMANENT EROSION AND SEDIMENT CONTROL MEASURES SHALL BE MAINTAINED AND REPAIRED AS NEEDED TO PREVENT ACCELERATED EROSION ON THE SITE AND ANY ADJACENT PROPERTIES. KEEP LAND DISTURBANCE TO A MINIMUM. PLAN THE PHASES OF CONSTRUCTION SO THAT ONLY THE AREAS ACTIVELY BEING DEVELOPED ARE EXPOSED. ALL OTHER AREAS SHOULD HAVE NATURAL VEGETATION PRESERVED, HAVE GOOD TEMPORARY COVER, OR PERMANENT VEGETATION ESTABLISHED.
2. ALL TOPSOIL, WHERE PHYSICALLY PRACTICABLE, SHALL BE SALVAGED AND NO TOPSOIL SHALL BE REMOVED FROM THE SITE. TOPSOIL AND OVERBURDEN SHALL BE SEGREGATED AND STOCKPILED SEPARATELY. RUNOFF FROM STOCKPILED AREA SHALL BE CONTROLLED TO PREVENT EROSION AND SEDIMENTATION.
3. PERMANENT VEGETATIVE COVER SHALL BE APPLIED TO DISTURBED AREAS WITHIN 14 DAYS AFTER FINAL GRADE IS REACHED ON ANY PORTION OF THE SITE. TEMPORARY VEGETATIVE COVER SHALL BE APPLIED WITHIN 14 DAYS TO DISTURBED AREAS WHICH MAY NOT BE AT FINAL GRADE, BUT WILL BE LEFT DORMANT FOR LONGER THAN 60 DAYS.

   TEMPORARY VEGETATIVE COVER SHALL CONSIST OF ANNUAL RYEGRASS AT 40 LBS PLS/ACRE. SEEDED AREAS SHALL BE HYDROMULCHED WITH A WOOD FIBER AND TACKIFIER AT 1 TON/ACRE.

   PERMANENT VEGETATIVE COVER – DROUGHT TOLERANT NATIVE GRASS SEED MIXTURE.
4. ALL DISTURBED AREAS SHALL RECEIVE PERMANENT VEGETATIVE COVER AS DESCRIBED ABOVE. ALL CUT OR FILL SLOPES WITH 3 TO 1 OR GREATER SLOPE SHALL BE COVERED WITH EROSION CONTROL MATTING OR HYDROMULCHED WITH A WOOD FIBER AND TACKIFIER AT 1 TON/ACRE.
5. ALL EROSION CONTROL MEASURES SHALL BE INSPECTED BY THE OWNER, OR OWNER APPROVED AGENT, AFTER ALL STORM EVENTS. ANY EROSION CONTROL MEASURES WHICH ARE DAMAGED PRIOR TO RE-ESTABLISHMENT OF VEGETATIVE COVER SHALL BE REPLACED IMMEDIATELY. THE REPAIR OF ANY COMPONENT OF THE SYSTEM SHALL BE MADE AS SOON AS POSSIBLE TO PREVENT ANY POTENTIAL POLLUTANTS, INCLUDING SILT, FROM EXITING THE DISTURBED AREA.

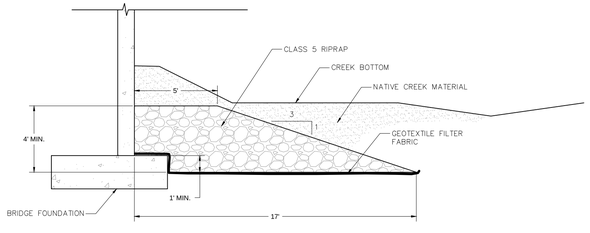
MAINTENANCE SCHEDULE DURING CONSTRUCTION

SEDIMENT CONTROL	INSPECTION	MAINTENANCE THRESHOLDS	MAINTENANCE ACTION
SILT FENCE	WEEKLY & AFTER 0.5 INCHES OF RAINFALL	SYSTEM INTEGRITY IS COMPROMISED	CLEAN OUT SEDIMENT REPLACE IF DAMAGED

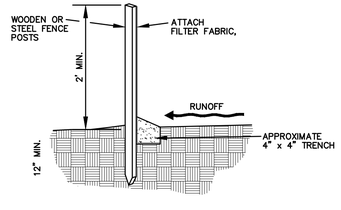
6. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE REMOVAL OF ALL TEMPORARY EROSION CONTROL DEVICES AFTER THE ESTABLISHMENT OF FULL VEGETATION.
7. MEANS OF EROSION AND SEDIMENT PROTECTION AS NOTED ON THE DRAWINGS INDICATE THE MINIMUM PROVISIONS NECESSARY. ADDITIONAL MEANS OF PROTECTION SHALL BE PROVIDED BY THE CONTRACTOR AS REQUIRED FOR CONTINUED OR UNFORESEEN EROSION PROBLEMS, AT NO ADDITIONAL EXPENSE TO THE OWNER.
8. CONSTRUCTION OPERATIONS SHALL BE PERFORMED TO PREVENT EROSION, SEDIMENT, AND DEBRIS FROM ENTERING BADGER CREEK.
9. CONSTRUCTION OPERATIONS SHALL BE PERFORMED TO PREVENT DISTURBANCE TO WETLAND AREAS. NO AREAS DESIGNATED AS WETLANDS ARE TO BE FILLED WITHOUT FIRST OBTAINING NECESSARY PERMITS FROM THE ARMY CORPS OF ENGINEERS. NO IN-STREAM CONSTRUCTION ACTIVITIES SHALL BE PERFORMED IN BADGER CREEK WITHOUT FIRST OBTAINING NECESSARY PERMITS FROM THE ARMY CORPS OF ENGINEERS.
10. CLASS 5 RIPRAP SHALL HAVE THE FOLLOWING GRADATION:
    D15 = 11.0 – 15.5 INCHES
    D50 = 17.0 – 20.5 INCHES
    D85 = 23.5 – 27.4 INCHES
    D100 = 36.0 INCHES

REVEGETATION NOTES

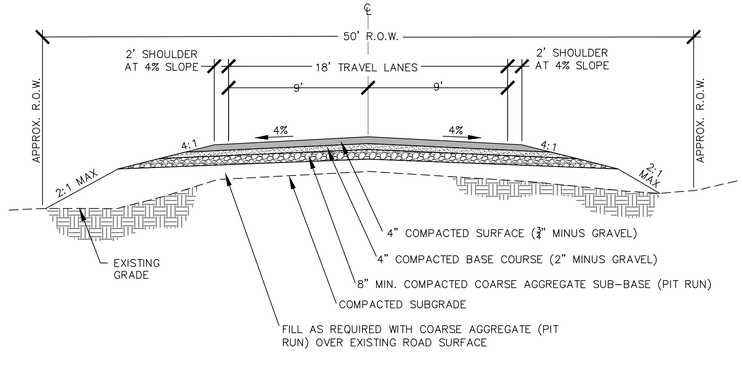
1. CLEAR AND GRUB AREAS OF PROPOSED GRADING. EXISTING PLANT MATERIALS MAY BE SALVAGED FOR TRANSPLANTING. STRIP EXISTING TOPSOIL IN AREAS OF PROPOSED EARTHWORK. STOCKPILE TOPSOIL AND SAVE FOR RE-USE AFTER ROUGH GRADING IS COMPLETED.
2. TOPSOIL AND OVERBURDEN SHALL BE REDISTRIBUTED WITHIN THE GRADED AREA AFTER ROUGH GRADING TO PROVIDE A SUITABLE BASE FOR AREAS WHICH WILL BE SEEDED AND PLANTED. SPREAD A MINIMUM OF 4" OF TOPSOIL OVER ALL DISTURBED AREAS. PROVIDE IMPORTED TOPSOIL IF STRIPPED AND SALVAGED TOPSOIL QUANTITIES ARE INSUFFICIENT.
3. SEED AND MULCH ALL DISTURBED AREAS WITH DROUGHT TOLERANT NATIVE SEED MIXTURE TO MATCH EXISTING ADJACENT NATIVE VEGETATION.
4. PROVIDE CONTINUOUS MAINTENANCE INCLUDING WATERING, WEED CONTROL, AND RE-SEEDING AS NECESSARY UNTIL THE VEGETATION IS ESTABLISHED.



RIPRAP DETAIL
NOT TO SCALE



SILT FENCE DETAIL
NOT TO SCALE



TYPICAL ROADWAY SECTION
NOT TO SCALE

CALL BEFORE YOU DIG
ONE CALL CENTER OF IDAHO
1-800-342-1585
CALL 2-BUSINESS DAYS IN ADVANCE BEFORE YOU DIG, GRADE, OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES.

NOTE: ALL SCALES INDICATED ARE FOR 24" X 36" PLOTTED SHEETS

HARMONY
DESIGN & ENGINEERING
110 E. LITTLE AVE. • DRIGGS ID. 83422
T 208.354.1331 F 208.354.1332

DATE: 4-5-2013 (BID SET)
REVISIONS:

PROFESSIONAL ENGINEER REGISTERED JENNIFER P. EVANS 11339 STATE OF IDAHO

SCALE: AS SHOWN
DESIGNED BY: RGB
DRAWN BY: RGB
CHECKED BY: JPZ
PROJ. #: 11002

PROJECT NAME
N 3000 W BADGER CREEK BRIDGE
TETON COUNTY, IDAHO

DETAILS AND NOTES

SHEET #
C-200

PLAN SET INDEX	
Sheet 1	Design Criteria and Plan View
Sheet 2	Arch, footing & wingwall details
Sheet 3	End views profiles
Sheet 4	Installation & manufacturing specifications
Sheet 5	Installation & manufacturing specifications continued

NOTES

GENERAL NOTES:

1. THIS BRIDGE HAS BEEN DESIGNED FOR GENERAL SITE CONDITIONS. THE PROJECT ENGINEER SHALL BE RESPONSIBLE FOR THE STRUCTURE'S SUITABILITY TO THE EXISTING SITE CONDITIONS AND FOR THE HYDRAULIC EVALUATION -- INCLUDING SCOUR AND CONFIRMATION OF SOIL CONDITIONS.

2. PRIOR TO CONSTRUCTION, CONTRACTOR MUST VERIFY ALL ELEVATIONS SHOWN THROUGH THE ENGINEER.

3. ONLY CONTECH BRIDGE SOLUTIONS INC. THE CON/SPAN® APPROVED PRECASTER IN IDAHO MAY PROVIDE THE STRUCTURE DESIGNED IN ACCORDANCE WITH THESE PLANS.

4. THE USE OF ANOTHER PRECAST STRUCTURE WITH THE DESIGN ASSUMPTIONS USED FOR THE CON/SPAN® STRUCTURE MAY LEAD TO SERIOUS DESIGN ERRORS. USE OF ANY OTHER PRECAST STRUCTURE WITH THIS DESIGN AND DRAWINGS VOIDS ANY CERTIFICATION OF THIS DESIGN AND WARRANTY. CONTECH BRIDGE SOLUTIONS INC. ASSUMES NO LIABILITY FOR DESIGN OF ANY ALTERNATE OR SIMILAR TYPE STRUCTURES.

5. ALTERNATE STRUCTURES MAY BE CONSIDERED, PROVIDED THAT SIGNED AND SEALED DESIGN DRAWINGS (AND CALCULATIONS) ARE SUBMITTED TO THE ENGINEER 2 WEEKS PRIOR TO THE BID DATE FOR REVIEW AND APPROVAL.

6. PROPOSED ALTERNATES TO A CON/SPAN® BRIDGE SYSTEM MUST SUBMIT AT LEAST TWO (2) INDEPENDENTLY VERIFIED FULL SCALE LOAD TESTS THAT CONFIRM THE PROPOSED DESIGN METHODOLOGY OF THE THREE SIDED/ARCH STRUCTURE(S). THE PROPOSED ALTERNATE, UPON SATISFACTORY CONFIRMATION OF DESIGN METHODOLOGY, MAY BE CONSIDERED AN ACCEPTABLE ALTERNATE.

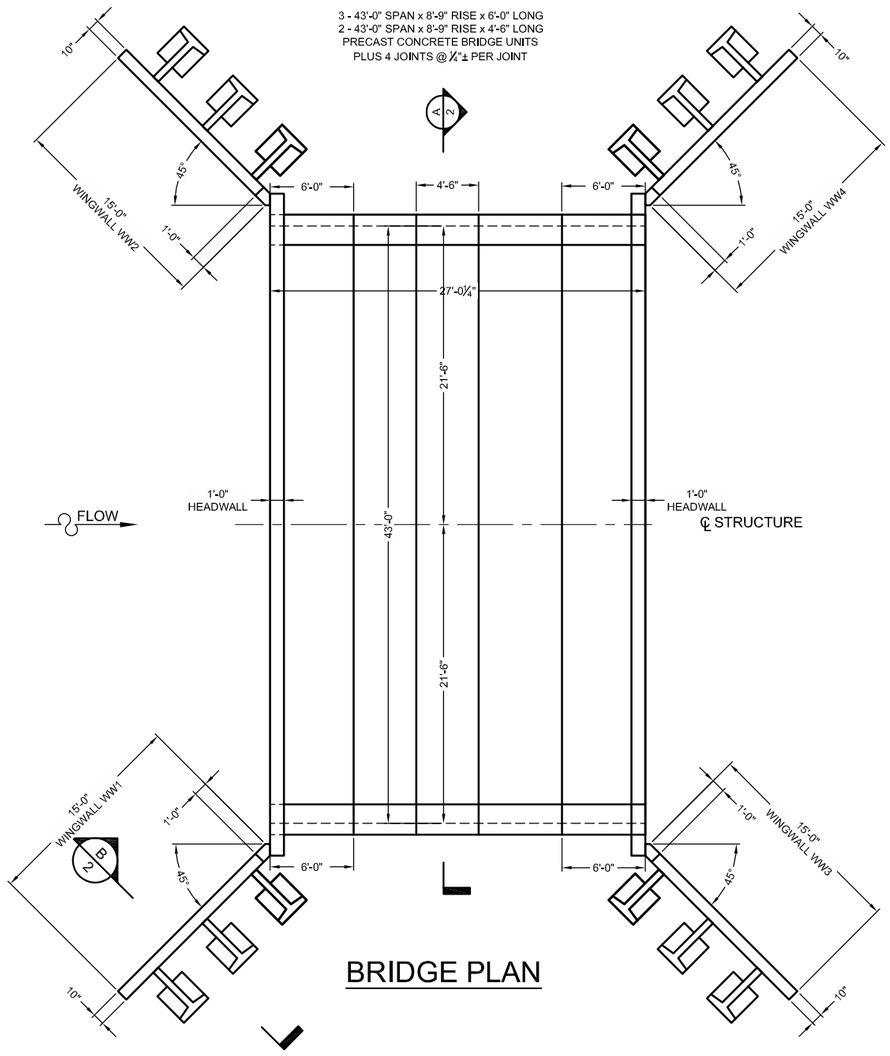
DESIGN DATA

DESIGN LOADING:
BRIDGE UNITS: HS20-44
HEADWALLS: EARTH PRESSURE + LIVE LOAD IMPACT
WINGWALLS: EARTH PRESSURE + LIVE LOAD SURCHARGE
DESIGN FILL HEIGHT: 1'-0" MIN. TO 2'-0" MAX. FROM TOP OF CROWN TO TOP OF PAVEMENT.
DESIGN METHOD: LOAD FACTOR PER AASHTO SPECIFICATION
ASSUMED NET ALLOWABLE SOIL BEARING PRESSURE: 4000 PSF *
ASSUMED GROSS ALLOWABLE SOIL BEARING PRESSURE: 4000 PSF *

*AT THE TIME OF DESIGN, A GEOTECHNICAL REPORT FOR THE PROJECT SITE WAS NOT AVAILABLE. IT IS THE PROJECT ENGINEER'S, OWNER'S AND/OR THE CONTRACTOR'S RESPONSIBILITY TO VERIFY THAT THE ACTUAL SITE CONDITIONS AT THE TIME OF CONSTRUCTION ARE CONSISTENT WITH THE ASSUMED ALLOWABLE SOIL BEARING PRESSURE WITH A GEOTECHNICAL INVESTIGATION FROM A QUALIFIED GEOTECHNICAL ENGINEER.

MATERIALS

PRECAST UNITS SHALL BE CONSTRUCTED AND INSTALLED IN ACCORDANCE WITH CON/SPAN® SPECIFICATIONS. CONCRETE FOR FOOTINGS SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 4000 PSI. REINFORCING STEEL FOR FOOTINGS SHALL CONFORM TO ASTM A615 OR A996-GRADE 60.



BRIDGE PLAN

MARK	DATE	REVISION DESCRIPTION	BY
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CONTECH® ENGINEERED SOLUTIONS LLC
www.ContechES.com
11835 NE Glenn Widing Drive, Portland, OR 97220
800-548-4667 503-240-3393 800-561-1271 FAX

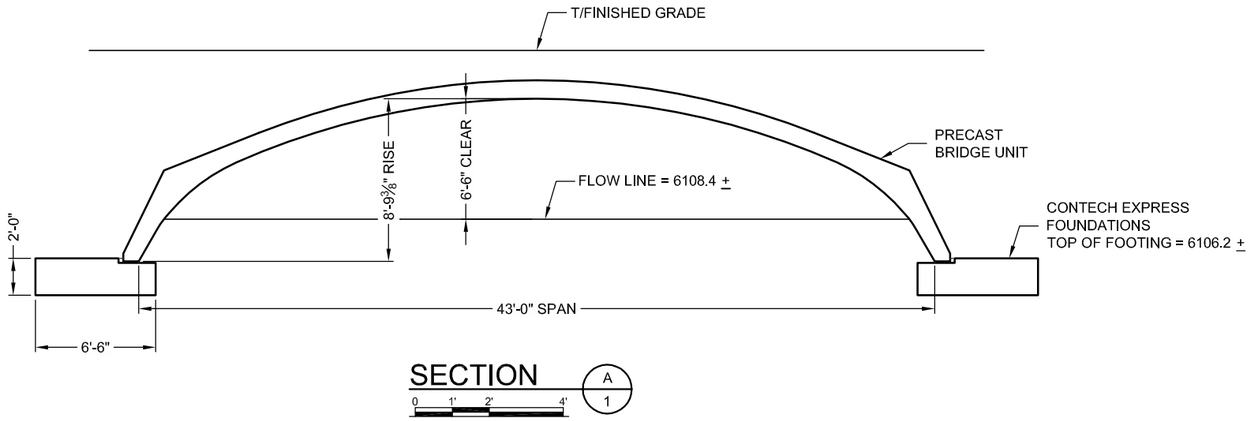
CON/SPAN® O-SERIES

PROPOSAL DRAWING

3000W Badger Creek Bridge
NOT FOR CONSTRUCTION

Tetonia, ID

PROJECT No.:	SEQ. No.:	DATE:
478150	010	4/5/2013
DESIGNED: KKV	DRAWN: N/A	
CHECKED: JL	APPROVED: XXX	
SHEET NO.: 1 OF 5		



SECTION A 1

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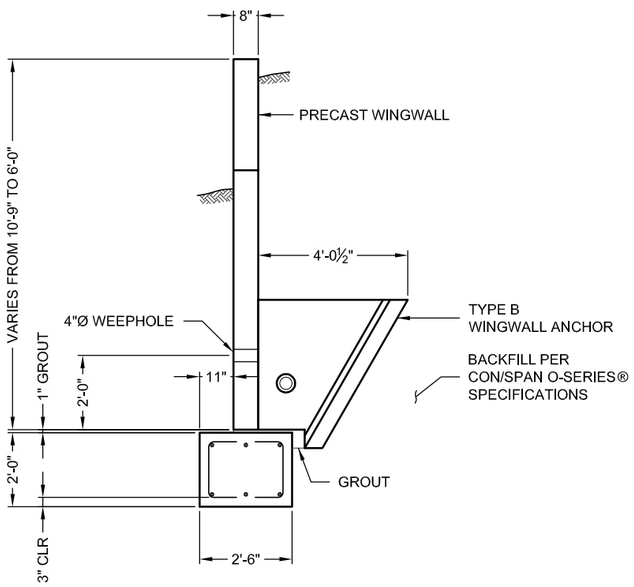

SECTION B 1

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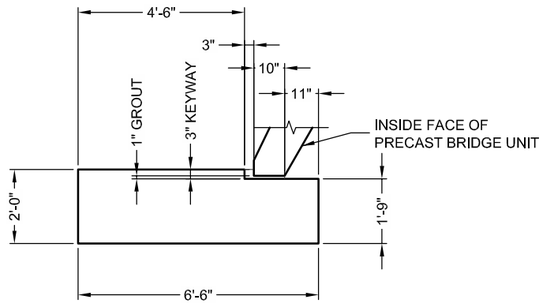

DETAIL C 1

0 1' 2' 4'

C:\DOCUMENTS AND SETTINGS\VOORHEES\MY DOCUMENTS\PROJECT FILES\IDAHO\CLARK~SE 5334\LEADS\478150 3000W BADGER CREEK\DESIGN\CONTECH\478150 BADGER CREEK O-843 PRELIM 4000 FR REV1 SHT X OF X.DWG 4/12/2013 3:30 PM

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3000W Badger Creek Bridge
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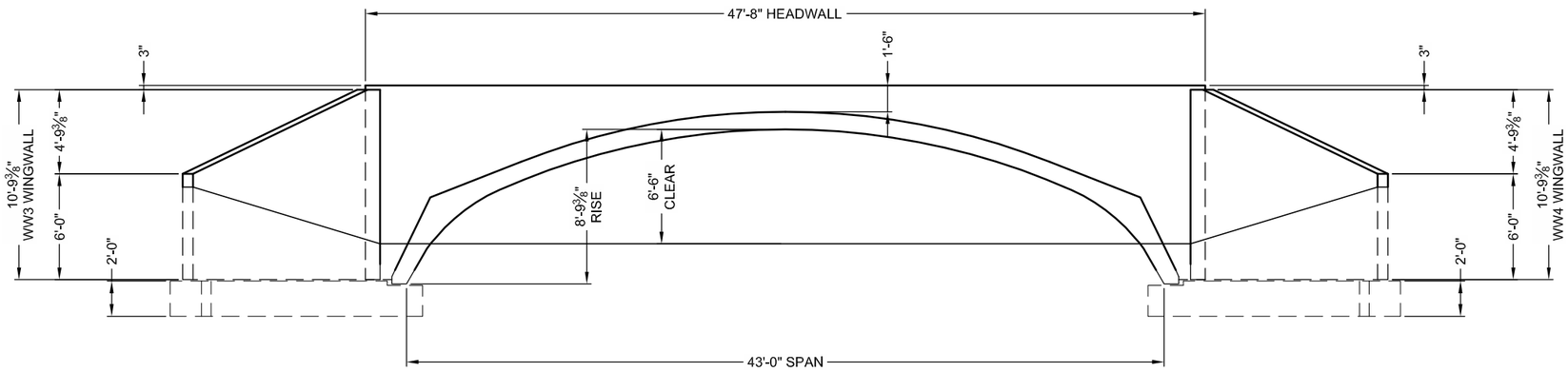
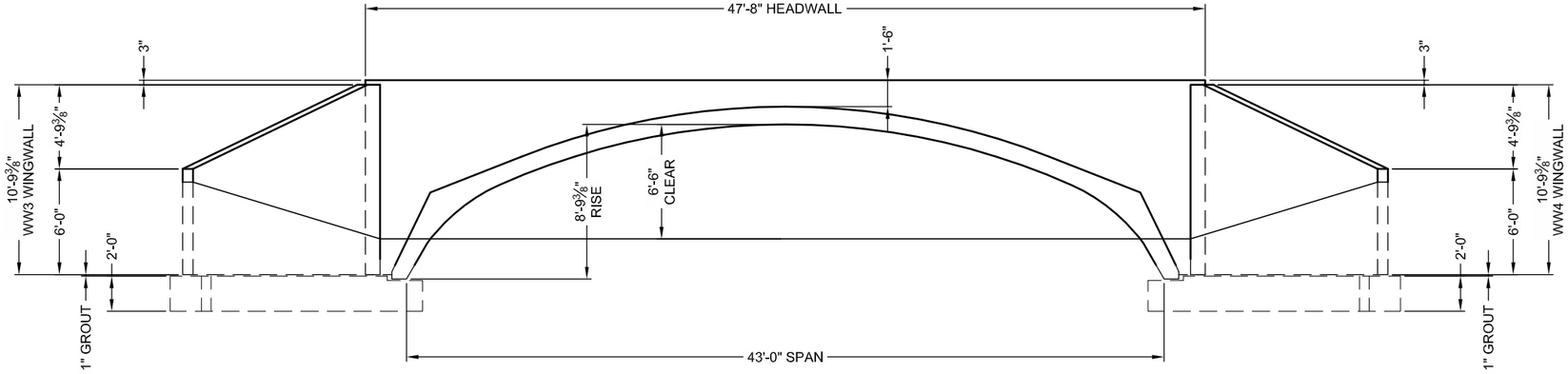
Tetonia, ID

PROJECT No.:	SEQ. No.:	DATE:
478150	010	4/5/2013
DESIGNED: KKV		DRAWN: N/A
CHECKED: JL		APPROVED: XXX
SHEET NO.: 2 OF 5		



UPSTREAM END ELEVATION



DOWNSTREAM END ELEVATION

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3000W Badger Creek Bridge
NOT FOR CONSTRUCTION

Tetonia, ID

PROJECT No.:	SEQ. No.:	DATE:
478150	010	4/5/2013
DESIGNED: KKV	DRAWN: N/A	
CHECKED: JL	APPROVED: XXX	
SHEET NO.: 3 OF 5		

SPECIFICATIONS FOR MANUFACTURE AND INSTALLATION OF CON/SPAN® BRIDGE SYSTEMS

1. DESCRIPTION
   1.1. TYPE - THIS WORK SHALL CONSIST OF FURNISHING AND CONSTRUCTING A CON/SPAN® BRIDGE SYSTEM IN ACCORDANCE WITH THESE SPECIFICATIONS AND IN REASONABLY CLOSE CONFORMITY WITH THE LINES, GRADES, DESIGN AND DIMENSIONS SHOWN ON THE PLANS OR AS ESTABLISHED BY THE ENGINEER. IN SITUATIONS WHERE TWO OR MORE SPECIFICATIONS APPLY TO THIS WORK, THE MOST STRINGENT REQUIREMENTS SHALL GOVERN.
   1.2. DESIGNATION - PRECAST REINFORCED CONCRETE CON/SPAN® BRIDGE UNITS MANUFACTURED IN ACCORDANCE WITH THIS SPECIFICATION SHALL BE DESIGNATED BY SPAN AND RISE. PRECAST REINFORCED CONCRETE WINGWALLS AND HEADWALLS MANUFACTURED IN ACCORDANCE WITH THIS SPECIFICATION SHALL BE DESIGNATED BY LENGTH, HEIGHT, AND DEFLECTION ANGLE.

2. DESIGN
   2.1. SPECIFICATIONS - THE PRECAST ELEMENTS ARE DESIGNED IN ACCORDANCE WITH THE "STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES" 17TH EDITION, ADOPTED BY THE AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS, 2002. A MINIMUM OF ONE FOOT OF COVER ABOVE THE CROWN OF THE BRIDGE UNITS IS REQUIRED IN THE INSTALLED CONDITION. (UNLESS NOTED OTHERWISE ON THE SHOP DRAWINGS AND DESIGNED ACCORDINGLY.)

3. MATERIALS
   3.1. CONCRETE - THE CONCRETE FOR THE PRECAST ELEMENTS SHALL BE AIR-ENTRAINED WHEN INSTALLED IN AREAS SUBJECT TO FREEZE-THAW CONDITIONS, COMPOSED OF PORTLAND CEMENT, FINE AND COARSE AGGREGATES, ADMIXTURES AND WATER. AIR-ENTRAINED CONCRETE SHALL CONTAIN 6 ± 2 PERCENT AIR. THE AIR- ENTRAINING ADMIXTURE SHALL CONFORM TO AASHT0 M154. THE MINIMUM CONCRETE COMPRESSIVE STRENGTH SHALL BE AS SHOWN ON THE SHOP DRAWINGS.
      3.1.1. PORTLAND CEMENT - SHALL CONFORM TO THE REQUIREMENTS OF ASTM SPECIFICATIONS C150-TYPE I, TYPE II, OR TYPE III CEMENT.
      3.1.2. COARSE AGGREGATE - SHALL CONSIST OF STONE HAVING A MAXIMUM SIZE OF 1 INCH. AGGREGATE SHALL MEET REQUIREMENTS FOR ASTM C33.
      3.1.3. WATER REDUCING ADMIXTURE - THE MANUFACTURER MAY SUBMIT, FOR APPROVAL BY THE ENGINEER, A WATER-REDUCING ADMIXTURE FOR THE PURPOSE OF INCREASING WORKABILITY AND REDUCING THE WATER REQUIREMENT FOR THE CONCRETE.
      3.1.4. CALCIUM CHLORIDE - THE ADDITION TO THE MIX OF CALCIUM CHLORIDE OR ADMIXTURES CONTAINING CALCIUM CHLORIDE WILL NOT BE PERMITTED.
      3.1.5. MIXTURE - THE AGGREGATES, CEMENT AND WATER SHALL BE PROPORTIONED AND MIXED IN A BATCH MIXER TO PRODUCE A HOMOGENEOUS CONCRETE MEETING THE STRENGTH REQUIREMENTS OF THIS SPECIFICATION. THE PROPORTION OF PORTLAND CEMENT IN THE MIXTURE SHALL NOT BE LESS THAN 564 POUNDS (6 SACKS) PER CUBIC YARD OF CONCRETE.
   3.2. STEEL REINFORCEMENT
      3.2.1. THE MINIMUM STEEL YIELD STRENGTH SHALL BE 60,000 PSI, UNLESS OTHERWISE NOTED ON THE SHOP DRAWINGS.
      3.2.2. ALL REINFORCING STEEL FOR THE PRECAST ELEMENTS SHALL BE FABRICATED AND PLACED IN ACCORDANCE WITH THE DETAILED SHOP DRAWINGS SUBMITTED BY THE MANUFACTURER.
      3.2.3. REINFORCEMENT SHALL CONSIST OF WELDED WIRE FABRIC CONFORMING TO ASTM SPECIFICATION A 185 OR A 497, OR DEFORMED BILLET STEEL BARS CONFORMING TO ASTM SPECIFICATION A 615, GRADE 60. LONGITUDINAL DISTRIBUTION REINFORCEMENT MAY CONSIST OF WELDED WIRE FABRIC OR DEFORMED BILLET-STEEL BARS.
   3.3. STEEL HARDWARE
      3.3.1. BOLTS AND THREADED RODS FOR WINGWALL CONNECTIONS SHALL CONFORM TO ASTM A 307. NUTS SHALL CONFORM TO AASHTO M292 (ASTM A194) GRADE 2H. ALL BOLTS, THREADED RODS AND NUTS USED IN WINGWALL CONNECTIONS SHALL BE MECHANICALLY ZINC COATED IN ACCORDANCE WITH ASTM B695 CLASS 50.
      3.3.2. STRUCTURAL STEEL FOR WINGWALL CONNECTION PLATES AND PLATE WASHERS SHALL CONFORM TO AASHTO M 270 (ASTM A 709) GRADE 36 AND SHALL BE HOT DIP GALVANIZED AS PER AASHTO M111 (ASTM A123).
      3.3.3. INSERTS FOR WINGWALLS SHALL BE 1" DIAMETER TWO-BOLT PRESET WINGWALL ANCHORS AS MANUFACTURED BY DAYTON/RICHMOND CONCRETE ACCESSORIES, MIAMISBURG, OHIO, (800) 745-3700.
      3.3.4. FERRULE LOOP INSERTS SHALL BE F-64 FERRULE LOOP INSERTS AS MANUFACTURED BY DAYTON/RICHMOND CONCRETE ACCESSORIES, MIAMISBURG, OHIO, (800) 745-3700.
      3.3.5. HOOK BOLTS USED IN ATTACHED HEADWALL CONNECTIONS SHALL BE ASTM A307.
      3.3.6. INSERTS FOR DETACHED HEADWALL CONNECTIONS SHALL BE AISI TYPE 304 STAINLESS STEEL, F-58 EXPANDED COIL INSERTS AS MANUFACTURED BY DAYTON/RICHMOND CONCRETE ACCESSORIES, MIAMISBURG, OHIO, (800) 745-3700. COIL RODS AND NUTS USED IN HEADWALL CONNECTIONS SHALL BE AISI TYPE 304 STAINLESS STEEL. WASHERS USED IN HEADWALL CONNECTIONS SHALL BE EITHER AISI TYPE 304 STAINLESS STEEL PLATE WASHERS OR AASHTO M270 (ASTM A709) GRADE 36 PLATE WASHERS HOT DIP GALVANIZED AS PER AASHTO M111 (ASTM A123).
      3.3.7. REINFORCING BAR SPLICES SHALL BE MADE USING THE DOWEL BAR SPLICER SYSTEM AS MANUFACTURED BY DAYTON/RICHMOND CONCRETE ACCESSORIES, MIAMISBURG, OHIO, (800) 745-3700, AND SHALL CONSIST OF THE DOWEL BAR SPLICER (DB-SAE) AND DOWEL-IN (DI).

4. MANUFACTURE OF PRECAST ELEMENTS - SUBJECT TO THE PROVISIONS OF SECTION 5, BELOW, THE PRECAST ELEMENT DIMENSION AND REINFORCEMENT DETAILS SHALL BE AS PRESCRIBED IN THE PLAN AND SHOP DRAWINGS PROVIDED BY THE MANUFACTURER.
   4.1. FORMS - THE FORMS USED IN MANUFACTURE SHALL BE SUFFICIENTLY RIGID AND ACCURATE TO MAINTAIN THE REQUIRED PRECAST ELEMENT DIMENSIONS WITHIN THE PERMISSIBLE VARIATIONS GIVEN IN SECTION 5 OF THESE SPECIFICATIONS. ALL CASTING SURFACES SHALL BE OF A SMOOTH MATERIAL.
   4.2. PLACEMENT OF REINFORCEMENT
      4.2.1. PLACEMENT OF REINFORCEMENT IN PRECAST BRIDGE UNITS - THE COVER OF CONCRETE OVER THE OUTSIDE CIRCUMFERENTIAL REINFORCEMENT SHALL BE 2" MINIMUM. THE COVER OF CONCRETE OVER THE INSIDE CIRCUMFERENTIAL REINFORCEMENT SHALL BE 1½" MINIMUM, UNLESS OTHERWISE NOTED ON THE SHOP DRAWINGS. THE CLEAR DISTANCE OF THE END CIRCUMFERENTIAL WIRES SHALL NOT BE LESS THAN 1" NOR MORE THAN 2" FROM THE ENDS OF EACH SECTION. REINFORCEMENT SHALL BE ASSEMBLED UTILIZING SINGLE OR MULTIPLE LAYERS OF WELDED WIRE FABRIC (NOT TO EXCEED 3 LAYERS), SUPPLEMENTED WITH A SINGLE LAYER OF DEFORMED BILLET-STEEL BARS, WHEN NECESSARY. WELDED WIRE FABRIC SHALL BE COMPOSED OF CIRCUMFERENTIAL AND LONGITUDINAL WIRES MEETING THE SPACING REQUIREMENTS OF 4.3, BELOW, AND SHALL CONTAIN SUFFICIENT LONGITUDINAL WIRES EXTENDING THROUGH THE BRIDGE UNIT TO MAINTAIN THE SHAPE AND POSITION OF THE REINFORCEMENT. LONGITUDINAL DISTRIBUTION REINFORCEMENT MAY BE WELDED WIRE FABRIC OR DEFORMED BILLET-STEEL BARS AND SHALL MEET THE SPACING REQUIREMENTS OF 4.3, BELOW. THE ENDS OF THE LONGITUDINAL DISTRIBUTION REINFORCEMENT SHALL BE NOT MORE THAN 3" AND NOT LESS THAN 1½" FROM THE ENDS OF THE BRIDGE UNIT.
      4.2.2. BENDING OF REINFORCEMENT FOR PRECAST BRIDGE UNITS - THE OUTSIDE AND INSIDE CIRCUMFERENTIAL REINFORCING STEEL FOR THE CORNERS OF THE BRIDGE SHALL BE BENT TO SUCH AN ANGLE THAT IS APPROXIMATELY EQUAL TO THE CONFIGURATION OF THE BRIDGE'S OUTSIDE CORNER.
      4.2.3. PLACEMENT OF REINFORCEMENT FOR PRECAST WINGWALLS AND HEADWALLS - THE COVER OF CONCRETE OVER THE LONGITUDINAL AND TRANSVERSE REINFORCEMENT SHALL BE 2" MINIMUM. THE CLEAR DISTANCE FROM THE END OF EACH PRECAST ELEMENT TO THE END OF REINFORCING STEEL SHALL NOT BE LESS THAN 1½" NOR MORE THAN 3". REINFORCEMENT SHALL BE ASSEMBLED UTILIZING A SINGLE LAYER OF WELDED WIRE FABRIC, OR A SINGLE LAYER OF DEFORMED BILLET-STEEL BARS. WELDED WIRE FABRIC SHALL BE COMPOSED OF TRANSVERSE AND LONGITUDINAL WIRES MEETING THE SPACING REQUIREMENTS OF 4.3, BELOW, AND SHALL CONTAIN SUFFICIENT LONGITUDINAL WIRES EXTENDING THROUGH THE ELEMENT TO MAINTAIN THE SHAPE AND POSITION OF THE REINFORCEMENT. LONGITUDINAL REINFORCEMENT MAY BE WELDED WIRE FABRIC OR DEFORMED BILLET-STEEL BARS AND SHALL MEET THE SPACING REQUIREMENTS OF 4.3, BELOW.
   4.3. LAPS, WELDS, SPACING
      4.3.1. LAPS, WELDS, AND SPACING FOR PRECAST BRIDGE UNITS - TENSION SPLICES IN THE CIRCUMFERENTIAL REINFORCEMENT SHALL BE MADE BY LAPPING. LAPS MAY BE TACK WELDED TOGETHER FOR ASSEMBLY PURPOSES. FOR SMOOTH WELDED WIRE FABRIC, THE OVERLAP SHALL MEET THE REQUIREMENTS OF AASHTO 8.30.2 AND 8.32.6. FOR DEFORMED WELDED WIRE FABRIC, THE OVERLAP SHALL MEET THE REQUIREMENTS OF AASHTO 8.30.1 AND 8.32.5. THE OVERLAP OF WELDED WIRE FABRIC SHALL BE MEASURED BETWEEN THE OUTER-MOST LONGITUDINAL WIRES OF EACH FABRIC SHEET. FOR DEFORMED BILLET-STEEL BARS, THE OVERLAP SHALL MEET THE REQUIREMENTS OF AASHTO 8.25. FOR SPLICES OTHER THAN TENSION SPLICES, THE OVERLAP SHALL BE A MINIMUM OF 1'-0" FOR WELDED WIRE FABRIC OR DEFORMED BILLET-STEEL BARS. THE SPACING CENTER TO CENTER OF THE CIRCUMFERENTIAL WIRES IN A WIRE FABRIC SHEET SHALL BE NOT LESS THAN 2" NOR MORE THAN 4". THE SPACING CENTER TO CENTER OF THE LONGITUDINAL WIRES SHALL NOT BE MORE THAN 8". THE SPACING CENTER TO CENTER OF THE LONGITUDINAL DISTRIBUTION STEEL FOR EITHER LINE OF REINFORCING IN THE TOP SLAB SHALL BE NOT MORE THAN 1'-4".
      4.3.2. LAPS, WELDS, AND SPACING FOR PRECAST WINGWALLS AND HEADWALLS - SPLICES IN THE REINFORCEMENT SHALL BE MADE BY LAPPING. LAPS MAY BE TACK WELDED TOGETHER FOR ASSEMBLY PURPOSES. FOR SMOOTH WELDED WIRE FABRIC, THE OVERLAP SHALL MEET THE REQUIREMENTS OF AASHTO 8.30.2 AND 8.32.6. FOR DEFORMED WELDED WIRE FABRIC, THE OVERLAP SHALL MEET THE REQUIREMENTS OF AASHTO 8.30.1 AND 8.32.5. FOR DEFORMED BILLET-STEEL BARS, THE OVERLAP SHALL MEET THE REQUIREMENTS OF AASHTO 8.25. THE SPACING CENTER-TO-CENTER OF THE WIRES IN A WIRE FABRIC SHEET SHALL BE NOT LESS THAN 2" NOR MORE THAN 8".
   4.4. CURING - THE PRECAST CONCRETE ELEMENTS SHALL BE CURED FOR A SUFFICIENT LENGTH OF TIME SO THAT THE CONCRETE WILL DEVELOP THE SPECIFIED COMPRESSIVE STRENGTH IN 28 DAYS OR LESS. ANY ONE OF THE FOLLOWING METHODS OF CURING OR COMBINATIONS THERE OF SHALL BE USED:
      4.4.1. STEAM CURING - THE PRECAST ELEMENTS MAY BE LOW-PRESSURE STEAM CURED BY A SYSTEM THAT WILL MAINTAIN A MOIST ATMOSPHERE.
      4.4.2. WATER CURING - THE PRECAST ELEMENTS MAY BE WATER CURED BY ANY METHOD THAT WILL KEEP THE SECTIONS MOIST.
      4.4.3. MEMBRANE CURING - A SEALING MEMBRANE CONFORMING TO THE REQUIREMENTS OF ASTM SPECIFICATION C309 MAY BE APPLIED AND SHALL BE LEFT INTACT UNTIL THE REQUIRED CONCRETE COMPRESSIVE STRENGTH IS ATTAINED. THE CONCRETE TEMPERATURE AT THE TIME OF STRENGTH IS ATTAINED. THE CONCRETE TEMPERATURE AT THE TIME OF APPLICATION SHALL BE WITHIN +/- 10 DEGREES F OF THE ATMOSPHERIC TEMPERATURE. ALL SURFACES SHALL BE KEPT MOIST PRIOR TO THE APPLICATION OF THE COMPOUNDS AND SHALL BE DAMP WHEN THE COMPOUND IS APPLIED.
   4.5. STORAGE, HANDLING & DELIVERY
      4.5.1. STORAGE - PRECAST CONCRETE BRIDGE ELEMENTS SHALL BE LIFTED AND STORED IN "AS-CAST" POSITION. PRECAST CONCRETE HEADWALL AND WINGWALL UNITS ARE CAST, STORED AND SHIPPED IN A FLAT POSITION. THE PRECAST ELEMENTS SHALL BE STORED IN SUCH A MANNER TO PREVENT CRACKING OR DAMAGE. STORE ELEMENTS USING TIMBER SUPPORTS AS APPROPRIATE. THE UNITS SHALL NOT BE MOVED UNTIL THE CONCRETE COMPRESSIVE STRENGTH HAS REACHED A MINIMUM OF 2500 PSI, AND THEY SHALL NOT BE STORED IN AN UPRIGHT POSITION.
      4.5.2. HANDLING - HANDLING DEVICES SHALL BE PERMITTED IN EACH PRECAST ELEMENT FOR THE PURPOSE OF HANDLING AND SETTING. SPREADER BEAMS MAY BE REQUIRED FOR THE LIFTING OF PRECAST CONCRETE BRIDGE ELEMENTS TO PRECLUDE DAMAGE FROM BENDING OR TORSION FORCES.
      4.5.3. DELIVERY - PRECAST CONCRETE ELEMENTS MUST NOT BE SHIPPED UNTIL THE CONCRETE HAS ATTAINED THE SPECIFIED DESIGN COMPRESSIVE STRENGTH, OR AS DIRECTED BY THE DESIGN ENGINEER. PRECAST CONCRETE ELEMENTS MAY BE UNLOADED AND PLACED ON THE GROUND AT THE SITE UNTIL INSTALLED. STORE ELEMENTS USING TIMBER SUPPORTS AS APPROPRIATE.
   4.6. QUALITY ASSURANCE - THE PRECASTER SHALL DEMONSTRATE ADHERENCE TO THE STANDARDS SET FORTH IN THE NPCA QUALITY CONTROL MANUAL. THE PRECASTER SHALL MEET EITHER SECTION 4.6.1 OR 4.6.2
      4.6.1. CERTIFICATION - THE PRECASTER SHALL BE CERTIFIED BY THE PRECAST/PRESTRESSED CONCRETE INSTITUTE PLANT CERTIFICATION PROGRAM OR THE NATIONAL PRECAST CONCRETE ASSOCIATION'S PLANT CERTIFICATION PROGRAM PRIOR TO AND DURING PRODUCTION OF THE PRODUCTS COVERED BY THIS SPECIFICATION.
      4.6.2. QUALIFICATIONS, TESTING AND INSPECTION
         4.6.2.1. THE PRECASTER SHALL HAVE BEEN IN THE BUSINESS OF PRODUCING PRECAST CONCRETE PRODUCTS SIMILAR TO THOSE SPECIFIED FOR A MINIMUM OF THREE YEARS. HE SHALL MAINTAIN A PERMANENT QUALITY CONTROL DEPARTMENT OR RETAIN AN INDEPENDENT TESTING AGENCY ON A CONTINUING BASIS. THE AGENCY SHALL ISSUE A REPORT, CERTIFIED BY A LICENSED ENGINEER, DETAILING THE ABILITY OF THE PRECASTER TO PRODUCE QUALITY PRODUCTS CONSISTENT WITH INDUSTRY STANDARDS.
         4.6.2.2. THE PRECASTER SHALL SHOW THAT THE FOLLOWING TESTS ARE PERFORMED IN ACCORDANCE WITH THE ASTM STANDARDS INDICATED. TESTS SHALL BE PERFORMED AS INDICATED IN SECTION 6 OF THESE SPECIFICATIONS.
            4.6.2.2.1. AIR CONTENT: C231 OR C173
            4.6.2.2.2. COMPRESSIVE STRENGTH: C31,C39,C497
         4.6.2.3. THE PRECASTER SHALL PROVIDE DOCUMENTATION DEMONSTRATING COMPLIANCE WITH THIS SECTION TO CONTECH® BRIDGE SOLUTIONS AT REGULAR INTERVALS OR UPON REQUEST.
         4.6.2.4. THE OWNER MAY PLACE AN INSPECTOR IN THE PLANT WHEN THE PRODUCTS COVERED BY THIS SPECIFICATION ARE BEING MANUFACTURED.
      4.6.3. DOCUMENTATION - THE PRECASTER SHALL SUBMIT PRECAST PRODUCTION REPORTS TO CONTECH® BRIDGE SOLUTIONS AS REQUIRED.

5. PERMISSIBLE VARIATIONS
   5.1. BRIDGE UNITS
      5.1.1. INTERNAL DIMENSIONS - THE INTERNAL DIMENSION SHALL VARY NOT MORE THAN 1% FROM THE DESIGN DIMENSIONS NOR MORE THAN 1½" WHICHEVER IS LESS.
      5.1.2. SLAB AND WALL THICKNESS - THE SLAB AND WALL THICKNESS SHALL NOT BE LESS THAN THAT SHOWN IN THE DESIGN BY MORE THAN ¼". A THICKNESS MORE THAN THAT REQUIRED IN THE DESIGN SHALL NOT BE CAUSE FOR REJECTION.
      5.1.3. LENGTH OF OPPOSITE SURFACES - VARIATIONS IN LAYING LENGTHS OF TWO OPPOSITE SURFACES OF THE BRIDGE UNIT SHALL NOT BE MORE THAN ½" IN ANY SECTION, EXCEPT WHERE BEVELED ENDS FOR LAYING OF CURVES ARE SPECIFIED BY THE PURCHASER.
      5.1.4. LENGTH OF SECTION - THE UNDERRUN IN LENGTH OF A SECTION SHALL NOT BE MORE THAN ½" IN ANY BRIDGE UNIT.
      5.1.5. POSITION OF REINFORCEMENT - THE MAXIMUM VARIATION IN POSITION OF THE REINFORCEMENT SHALL BE ± ½", IN NO CASE SHALL THE COVER OVER THE REINFORCEMENT BE LESS THAN 1½" FOR THE OUTSIDE CIRCUMFERENTIAL STEEL OR BE LESS THAN 1" FOR THE INSIDE CIRCUMFERENTIAL STEEL AS MEASURED TO THE EXTERNAL OR INTERNAL SURFACE OF THE BRIDGE. THESE TOLERANCES OR COVER REQUIREMENTS DO NOT APPLY TO MATING SURFACES OF THE JOINTS.
      5.1.6. AREA OF REINFORCEMENT - THE AREAS OF STEEL REINFORCEMENT SHALL BE THE DESIGN STEEL AREAS AS SHOWN IN THE MANUFACTURER'S SHOP DRAWINGS. STEEL AREAS GREATER THAN THOSE REQUIRED SHALL NOT BE CAUSE FOR REJECTION. THE PERMISSIBLE VARIATION IN DIAMETER OF ANY REINFORCEMENT SHALL CONFORM TO THE TOLERANCES PRESCRIBED IN THE ASTM SPECIFICATION FOR THAT TYPE OF REINFORCEMENT.
   5.2. WINGWALLS & HEADWALLS
      5.2.1. WALL THICKNESS - THE WALL THICKNESS SHALL NOT VARY FROM THAT SHOWN IN THE DESIGN BY MORE THAN ½".
      5.2.2. LENGTH/HEIGHT OF WALL SECTIONS - THE LENGTH AND HEIGHT OF THE WALL SHALL NOT VARY FROM THAT SHOWN IN THE DESIGN BY MORE THAN ½".
      5.2.3. POSITION OF REINFORCEMENT - THE MAXIMUM VARIATION IN THE POSITION OF THE REINFORCEMENT SHALL BE ± ½", IN NO CASE SHALL THE COVER OVER THE REINFORCEMENT BE LESS THAN 1½".
      5.2.4. SIZE OF REINFORCEMENT - THE PERMISSIBLE VARIATION IN DIAMETER OF ANY REINFORCING SHALL CONFORM TO THE TOLERANCES PRESCRIBED IN THE ASTM SPECIFICATION FOR THAT TYPE OF REINFORCING. STEEL AREA GREATER THAN THAT REQUIRED SHALL NOT BE CAUSE FOR REJECTION.

6. TESTING/ INSPECTION
   6.1. TESTING
      6.1.1. TYPE OF TEST SPECIMEN - CONCRETE COMPRESSIVE STRENGTH SHALL BE DETERMINED FROM COMPRESSION TESTS MADE ON CYLINDERS OR CORES. FOR CYLINDER TESTING, A MINIMUM OF 4 CYLINDERS SHALL BE TAKEN FOR EACH BRIDGE ELEMENT. EACH ELEMENT SHALL BE CONSIDERED SEPARATELY FOR THE PURPOSE OF TESTING AND ACCEPTANCE.
      6.1.2. COMPRESSION TESTING - CYLINDERS SHALL BE MADE AND TESTED AS PRESCRIBED BY THE ASTM C39 SPECIFICATION. CYLINDERS SHALL BE CURED IN THE SAME ENVIRONMENT AS THE BRIDGE ELEMENTS. CORES SHALL BE OBTAINED AND TESTED FOR COMPRESSIVE STRENGTH IN ACCORDANCE WITH THE PROVISIONS OF THE ASTM C42 SPECIFICATION.
      6.1.3. ACCEPTABILITY OF CYLINDER TESTS - WHEN THE AVERAGE COMPRESSIVE STRENGTH OF ALL CYLINDERS TESTED IS EQUAL TO OR GREATER THAN THE DESIGN COMPRESSIVE STRENGTH, AND NOT MORE THAN 10% OF THE CYLINDERS TESTED HAVE A COMPRESSIVE STRENGTH LESS THAN THE DESIGN CONCRETE STRENGTH, AND NO CYLINDER TESTED HAS A COMPRESSIVE STRENGTH LESS THAN 80% OF THE DESIGN COMPRESSIVE STRENGTH, THEN THE ELEMENT SHALL BE ACCEPTED. WHEN THE COMPRESSIVE STRENGTH OF THE CYLINDERS TESTED DOES NOT CONFORM TO THESE ACCEPTANCE CRITERIA, THE ACCEPTABILITY OF THE ELEMENT MAY BE DETERMINED AS DESCRIBED IN SECTION 6.1.4, BELOW.
      6.1.4. ACCEPTABILITY OF CORE TESTS - THE COMPRESSIVE STRENGTH OF THE CONCRETE IN A BRIDGE ELEMENT IS ACCEPTABLE WHEN THE AVERAGE CORE TEST STRENGTH IS EQUAL TO OR GREATER THAN THE DESIGN CONCRETE STRENGTH. WHEN THE COMPRESSIVE STRENGTH OF A CORE TESTED IS LESS THAN THE DESIGN CONCRETE STRENGTH, THE PRECAST ELEMENT FROM WHICH THAT CORE WAS TAKEN MAY BE RE-CORED. WHEN THE COMPRESSIVE STRENGTH OF THE RE-CORE IS EQUAL TO OR GREATER THAN THE DESIGN CONCRETE STRENGTH, THE COMPRESSIVE STRENGTH OF THE CONCRETE IN THAT BRIDGE ELEMENT IS ACCEPTABLE.
         6.1.4.1. WHEN THE COMPRESSIVE STRENGTH OF ANY RECORE IS LESS THAN THE DESIGN CONCRETE STRENGTH, THE PRECAST ELEMENT FROM WHICH THAT CORE WAS TAKEN SHALL BE REJECTED.
         6.1.4.2. PLUGGING CORE HOLES - THE CORE HOLES SHALL BE PLUGGED AND SEALED BY THE MANUFACTURER IN A MANNER SUCH THAT THE ELEMENTS WILL MEET ALL OF THE TEST REQUIREMENTS OF THIS SPECIFICATION. PRECAST ELEMENTS SO SEALED SHALL BE CONSIDERED SATISFACTORY FOR USE.
         6.1.4.3. TEST EQUIPMENT - EVERY MANUFACTURER FURNISHING PRECAST ELEMENTS UNDER THIS SPECIFICATION SHALL FURNISH ALL FACILITIES AND PERSONNEL NECESSARY TO CARRY OUT THE TEST REQUIRED.
   6.2. INSPECTION - THE QUALITY OF MATERIALS, THE PROCESS OF MANUFACTURE, AND THE FINISHED PRECAST ELEMENTS SHALL BE SUBJECT TO INSPECTION BY THE PURCHASER.

7. JOINTS
   THE BRIDGE UNITS SHALL BE PRODUCED WITH FLAT BUTT ENDS. THE ENDS OF THE BRIDGE UNITS SHALL BE SUCH THAT WHEN THE SECTIONS ARE LAID TOGETHER THEY WILL MAKE A CONTINUOUS LINE WITH A SMOOTH INTERIOR FREE OF APPRECIABLE IRREGULARITIES, ALL COMPATIBLE WITH THE PERMISSIBLE VARIATIONS IN SECTION 5, ABOVE. THE JOINT WIDTH BETWEEN ADJACENT PRECAST UNITS SHALL NOT EXCEED ¾".

8. WORKMANSHIP/ FINISH
   THE BRIDGE UNITS, WINGWALLS, AND HEADWALLS SHALL BE SUBSTANTIALLY FREE OF FRACTURES. THE ENDS OF THE BRIDGE UNITS SHALL BE NORMAL TO THE WALLS AND CENTERLINE OF THE BRIDGE SECTION, WITHIN THE LIMITS OF THE VARIATIONS GIVEN IN SECTION 5, ABOVE, EXCEPT WHERE BEVELED ENDS ARE SPECIFIED. THE FACES OF THE WINGWALLS AND HEADWALLS SHALL BE PARALLEL TO EACH OTHER, WITHIN THE LIMITS OF VARIATIONS GIVEN IN SECTION 5, ABOVE. THE SURFACE OF THE PRECAST ELEMENTS SHALL BE A SMOOTH STEEL FORM OR TROWELED SURFACE. TRAPPED AIR POCKETS CAUSING SURFACE DEFECTS SHALL BE CONSIDERED AS PART OF A SMOOTH, STEEL FORM FINISH.

9. REPAIRS
   PRECAST ELEMENTS MAY BE REPAIRED, IF NECESSARY, BECAUSE OF IMPERFECTIONS IN MANUFACTURE OR HANDLING DAMAGE AND WILL BE ACCEPTABLE IF, IN THE OPINION OF THE PURCHASER, THE REPAIRS ARE SOUND, PROPERLY FINISHED AND CURED, AND THE REPAIRED SECTION CONFORMS TO THE REQUIREMENTS OF THIS SPECIFICATION.

10. REJECTION
    THE PRECAST ELEMENTS SHALL BE SUBJECT TO REJECTION ON ACCOUNT OF ANY OF THE SPECIFICATION REQUIREMENTS. INDIVIDUAL PRECAST ELEMENTS MAY BE REJECTED BECAUSE OF ANY OF THE FOLLOWING:
    10.1. FRACTURES OR CRACKS PASSING THROUGH THE WALL, EXCEPT FOR A SINGLE END CRACK THAT DOES NOT EXCEED ONE HALF THE THICKNESS OF THE WALL.
    10.2. DEFECTS THAT INDICATE PROPORTIONING, MIXING, AND MOLDING NOT IN COMPLIANCE WITH SECTION 4 OF THESE SPECIFICATIONS.
    10.3. HONEYCOMBED OR OPEN TEXTURE.
    10.4. DAMAGED ENDS, WHERE SUCH DAMAGE WOULD PREVENT MAKING A SATISFACTORY JOINT.

11. MARKING
    EACH BRIDGE UNIT SHALL BE CLEARLY MARKED BY WATERPROOF PAINT. THE FOLLOWING SHALL BE SHOWN ON THE INSIDE OF THE VERTICAL LEG OF THE BRIDGE SECTION:
    BRIDGE SPAN x BRIDGE RISE
    DATE OF MANUFACTURE
    NAME OR TRADEMARK OF THE MANUFACTURER

MARK	DATE	REVISION DESCRIPTION	BY
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CON/SPAN® S-SERIES

PROPOSAL DRAWING

3000W Badger Creek Bridge
NOT FOR CONSTRUCTION

Tetonia, ID

PROJECT No.:	SEQ. No.:	DATE:
478150	010	4/5/2013
DESIGNED: KKV	DRAWN: N/A	
CHECKED: JL	APPROVED: XXX	
SHEET NO.: 4 OF 5		

SPECIFICATIONS FOR MANUFACTURE AND INSTALLATION OF CON/SPAN® BRIDGE SYSTEMS (CONT'D)

12. INSTALLATION PREPARATION
TO ENSURE CORRECT INSTALLATION OF THE PRECAST CONCRETE BRIDGE SYSTEM, CARE AND CAUTION MUST BE EXERCISED IN FORMING THE SUPPORT AREAS FOR BRIDGE UNITS, HEADWALL, AND WINGWALL ELEMENTS. EXERCISING SPECIAL CARE WILL FACILITATE THE RAPID INSTALLATION OF THE PRECAST COMPONENTS.

12.1. FOOTINGS
DO NOT OVER EXCAVATE FOUNDATIONS UNLESS DIRECTED BY SITE SOIL ENGINEER TO REMOVE UNSUITABLE SOIL.

THE SITE SOILS ENGINEER SHALL CERTIFY THAT THE BEARING CAPACITY MEETS OR EXCEEDS THE FOOTING DESIGN REQUIREMENTS, PRIOR TO THE CONTRACTOR POURING OF THE FOOTINGS.

THE BRIDGE UNITS AND WINGWALLS SHALL BE INSTALLED ON EITHER PRECAST OR CAST-IN-PLACE CONCRETE FOOTINGS. THE SIZE AND ELEVATION OF THE FOOTINGS SHALL BE AS DESIGNED BY THE ENGINEER. A KEYWAY SHALL BE FORMED IN THE TOP SURFACE OF THE BRIDGE FOOTING AS SPECIFIED ON THE PLANS. NO KEYWAY IS REQUIRED IN THE WINGWALL FOOTINGS, UNLESS OTHERWISE SPECIFIED ON THE PLANS.

THE FOOTINGS SHALL BE GIVEN A SMOOTH FLOAT FINISH AND SHALL REACH A COMPRESSIVE STRENGTH OF 2,000 PSI BEFORE PLACEMENT OF THE BRIDGE AND WINGWALL ELEMENTS. BACKFILLING SHALL NOT BEGIN UNTIL THE FOOTING HAS REACHED THE FULL DESIGN COMPRESSIVE STRENGTH.

THE FOOTING SURFACE SHALL BE CONSTRUCTED IN ACCORDANCE WITH GRADES SHOWN ON THE PLANS. WHEN TESTED WITH A 10'-0" STRAIGHT EDGE, THE SURFACE SHALL NOT VARY MORE THAN ¼" IN 10'-0".

IF A PRECAST CONCRETE FOOTING IS USED, THE CONTRACTOR SHALL PREPARE A 4" THICK BASE LAYER OF COMPACTED GRANULAR MATERIAL THE FULL WIDTH OF THE FOOTING PRIOR TO PLACING THE PRECAST FOOTING.

THE FOUNDATIONS FOR PRECAST CONCRETE BRIDGE ELEMENTS AND WINGWALLS MUST BE CONNECTED BY REINFORCEMENT TO FORM ONE MONOLITHIC BODY. EXPANSION JOINTS SHALL NOT BE USED.

THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE CONSTRUCTION OF THE FOUNDATIONS PER THE PLANS AND SPECIFICATIONS.

13. INSTALLATION
13.1. GENERAL - THE INSTALLATION OF THE PRECAST CONCRETE ELEMENTS SHALL BE AS EXPLAINED IN THE PUBLICATION CON/SPAN BRIDGE SYSTEMS INSTALLATION HANDBOOK.

13.1.1. LIFTING - IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO ENSURE THAT A CRANE OF THE CORRECT LIFTING CAPACITY IS AVAILABLE TO HANDLE THE PRECAST CONCRETE UNITS. THIS CAN BE ACCOMPLISHED BY USING THE WEIGHTS GIVEN FOR THE PRECAST CONCRETE COMPONENTS AND BY DETERMINING THE LIFTING REACH FOR EACH CRANE UNIT. SITE CONDITIONS MUST BE CHECKED WELL IN ADVANCE OF SHIPPING TO ENSURE PROPER CRANE LOCATION AND TO AVOID ANY LIFTING RESTRICTIONS. THE LIFT ANCHORS OR HOLES PROVIDED IN EACH UNIT ARE THE ONLY MEANS TO BE USED TO LIFT THE ELEMENTS. THE PRECAST CONCRETE ELEMENTS MUST NOT BE SUPPORTED OR RAISED BY OTHER MEANS THAN THOSE GIVEN IN THE MANUALS AND DRAWINGS WITHOUT WRITTEN APPROVAL FROM CONTECH® BRIDGE SOLUTIONS.

13.1.2. CONSTRUCTION EQUIPMENT WEIGHT RESTRICTIONS - IN NO CASE SHALL EQUIPMENT OPERATING IN EXCESS OF THE DESIGN LOAD (HS20 OR HS25) BE PERMITTED OVER THE BRIDGE UNITS UNLESS APPROVED BY CONTECH® BRIDGE SOLUTIONS.

13.1.2.1. IN THE IMMEDIATE AREA OF THE BRIDGE UNITS, THE FOLLOWING RESTRICTIONS FOR THE USE OF HEAVY CONSTRUCTION MACHINERY DURING BACKFILLING OPERATIONS APPLY:
NO CONSTRUCTION EQUIPMENT SHALL CROSS THE BARE
- PRECAST CONCRETE BRIDGE UNIT.
AFTER THE COMPACTED FILL LEVEL HAS REACHED A MINIMUM OF
- 4" OVER THE CROWN OF THE BRIDGE, CONSTRUCTION EQUIPMENT WITH A WEIGHT OF LESS THAN 10 TONS MAY CROSS THE BRIDGE.
AFTER THE COMPACTED FILL LEVEL HAS REACHED A MINIMUM OF
- 1'-0" OVER THE CROWN OF THE BRIDGE, CONSTRUCTION EQUIPMENT WITH A WEIGHT OF LESS THAN 30 TONS MAY CROSS THE BRIDGE.
AFTER THE COMPACTED FILL LEVEL HAS REACHED THE DESIGN
- COVER, OR 2'-0" MINIMUM, OVER THE CROWN OF THE PRECAST CONCRETE BRIDGE, CONSTRUCTION EQUIPMENT WITHIN THE DESIGN LOAD LIMITS FOR THE ROAD MAY CROSS THE PRECAST CONCRETE BRIDGE.

13.2. LEVELING PAD/SHIMS - THE BRIDGE UNITS AND WINGWALLS SHALL BE SET ON MASONITE OR STEEL SHIMS MEASURING 5" x 5", MINIMUM, UNLESS SHOWN OTHERWISE ON THE PLANS. A MINIMUM GAP OF ½" SHALL BE PROVIDED BETWEEN THE FOOTING AND THE BOTTOM OF THE BRIDGE'S VERTICAL LEGS OR THE BOTTOM OF THE WINGWALL. ALSO, A SUPPLY OF ½", ¼" & ⅛" THICK STEEL OR MASONITE SHIMS FOR VARIOUS SHIMMING PURPOSES SHOULD BE ON SITE.

13.3. PLACEMENT OF BRIDGE UNITS - THE BRIDGE UNITS SHALL BE PLACED AS SHOWN ON THE ENGINEER'S PLAN DRAWINGS. SPECIAL CARE SHALL BE TAKEN IN SETTING THE ELEMENTS TO THE TRUE LINE AND GRADE. THE JOINT WIDTH BETWEEN ADJACENT PRECAST UNITS SHALL NOT EXCEED ¾".

13.4. IT IS IMPERATIVE THAT ANY LATERAL SPREADING OF THE BRIDGE ELEMENTS BE AVOIDED DURING AND AFTER THEIR PLACEMENT. GENERALLY, HORIZONTAL CABLE TIES OR TIE RODS ARE SHIPPED IN THE BRIDGE ELEMENTS TO PREVENT THIS SPREADING. CABLE TIES/TIE RODS SHALL NOT BE REMOVED UNTIL BRIDGE UNITS ARE GROUTED AND GROUT HAS CURED. IF, HOWEVER, DUE TO SITE RESTRICTIONS, THESE CABLE TIES/TIE RODS MUST BE REMOVED PRIOR TO PLACEMENT OF THE BRIDGE ELEMENTS, THE CONTRACTOR MUST NOTIFY CONTECH (MANUFACTURER) AND REQUEST A SUGGESTED INSTALLATION PROCEDURE.

IN ADDITION, IF THE CABLE TIES/TIE RODS MUST BE REMOVED PRIOR TO SETTING ARCH UNITS, THE FOLLOWING QUALITY CONTROL PROCEDURE MUST BE FOLLOWED:
1) FIND "MEASURED SPAN" UPON ARCH UNIT'S DELIVERY TO SITE, PRIOR TO LIFTING FROM TRUCK AND REMOVING CABLE TIES/TIE RODS. "MEASURED SPAN" SHALL BE THE AVERAGE OF (3) SPAN MEASUREMENTS ALONG THE LAY LENGTH OF THE ARCH UNIT.

2) AFTER SETTING OF BRIDGE UNIT ON THE FOUNDATION, VERIFY THE SPAN. THIS "INSTALLED SPAN MEASUREMENT" SHALL NOT EXCEED THE MAXIMUM OF
A) THE NOMINAL SPAN +½" OR
B) THE "MEASURED SPAN".
IF THE "INSTALLED SPAN MEASUREMENT" EXCEEDS THIS AMOUNT, THE ARCH UNIT SHALL BE LIFTED AND RE-SET UNTIL THE "INSTALLED SPAN MEASUREMENT" MEETS THE LIMITS.

13.5. PLACEMENT OF WINGWALLS & HEADWALLS - THE WINGWALLS AND HEADWALLS SHALL BE PLACED AS SHOWN ON THE PLAN DRAWINGS. SPECIAL CARE SHALL BE TAKEN IN SETTING THE ELEMENTS TO THE TRUE LINE AND GRADE.

13.6. WATERPROOFING/JOINT PROTECTION AND SUBSURFACE DRAINAGE

13.6.1. EXTERNAL PROTECTION OF JOINTS - THE BUTT JOINT MADE BY TWO ADJOINING BRIDGE UNITS SHALL BE COVERED WITH A ⅞" x 1⅛" PREFORMED BITUMINOUS JOINT SEALANT AND A MINIMUM OF A 9" WIDE JOINT WRAP. THE SURFACE SHALL BE FREE OF DIRT BEFORE APPLYING THE JOINT MATERIAL. A PRIMER COMPATIBLE WITH THE JOINT WRAP TO BE USED SHALL BE APPLIED FOR A MINIMUM WIDTH OF 9" ON EACH SIDE OF THE JOINT. THE EXTERNAL WRAP SHALL BE EITHER EZ-WRAP RUBBER BY PRESS-SEAL GASKET CORPORATION, SEAL WRAP BY MAR MAC MANUFACTURING CO. INC. OR APPROVED EQUAL. THE JOINT SHALL BE COVERED CONTINUOUSLY FROM THE BOTTOM OF ONE BRIDGE SECTION LEG, ACROSS THE TOP OF THE BRIDGE AND TO THE OPPOSITE BRIDGE SECTION LEG. ANY LAPS THAT RESULT IN THE JOINT WRAP SHALL BE A MINIMUM OF 6" LONG WITH THE OVERLAP RUNNING DOWNHILL.

13.6.2. IN ADDITION TO THE JOINTS BETWEEN BRIDGE UNITS, THE JOINT BETWEEN THE END BRIDGE UNIT AND THE HEADWALL SHALL ALSO BE SEALED AS DESCRIBED ABOVE. IF PRECAST WINGWALLS ARE USED, THE JOINT BETWEEN THE END BRIDGE UNIT AND THE WINGWALL SHALL BE SEALED WITH A 2'-0" STRIP OF FILTER FABRIC. ALSO, IF LIFT HOLES ARE FORMED IN THE BRIDGE UNITS, THEY SHALL BE PRIMED AND COVERED WITH A 9" x 9" SQUARE OF JOINT WRAP.

13.6.3. DURING THE BACKFILLING OPERATION, CARE SHALL BE TAKEN TO KEEP THE JOINT WRAP IN ITS PROPER LOCATION OVER THE JOINT.

13.6.4. SUBSOIL DRAINAGE SHALL BE AS DIRECTED BY THE ENGINEER.

13.7. GROUTING

13.7.1. GROUTING SHALL NOT BE PERFORMED WHEN TEMPERATURES ARE EXPECTED TO GO BELOW 35° FOR A PERIOD OF 72 HOURS. FILL THE BRIDGE-FOUNDATION KEYWAY WITH CEMENT GROUT (PORTLAND CEMENT AND WATER OR CEMENT MORTAR COMPOSED OF PORTLAND CEMENT, SAND AND WATER) WITH A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 3000 PSI. VIBRATE AS REQUIRED TO ENSURE THAT THE ENTIRE KEY AROUND THE BRIDGE ELEMENT IS COMPLETELY FILLED. IF BRIDGE ELEMENTS HAVE BEEN SET WITH TEMPORARY TIES (CABLES, BARS, ETC.) GROUT MUST ATTAIN A MINIMUM COMPRESSIVE STRENGTH OF 1500 PSI BEFORE TIES MAY BE REMOVED.

13.7.2. ALL GROUT SHALL HAVE A MAXIMUM AGGREGATE SIZE OF ¼".

13.7.3. LIFTING AND ERECTION ANCHOR RECESSES SHALL BE FILLED WITH GROUT.

13.8. BACKFILL

13.8.1. DO NOT PERFORM BACKFILLING DURING WET OR FREEZING WEATHER.

13.8.2. NO BACKFILL SHALL BE PLACED AGAINST ANY STRUCTURAL ELEMENTS UNTIL THEY HAVE BEEN APPROVED BY THE ENGINEER.

13.8.3. BACKFILL SHALL BE CONSIDERED AS ALL REPLACED EXCAVATION AND NEW EMBANKMENT ADJACENT TO THE PRECAST CONCRETE ELEMENTS. THE PROJECT CONSTRUCTION AND MATERIAL SPECIFICATIONS, WHICH INCLUDE THE SPECIFICATIONS FOR EXCAVATION FOR STRUCTURES AND ROADWAY EXCAVATION AND EMBANKMENT CONSTRUCTION, SHALL APPLY EXCEPT AS MODIFIED IN THIS SECTION.

13.8.4. BACKFILL ZONES:
IN-SITU SOIL
- ZONE A: CONSTRUCTED EMBANKMENT OR OVERFILL.
- ZONE B: FILL THAT IS DIRECTLY ASSOCIATED WITH PRECAST
- CONCRETE BRIDGE INSTALLATION.
ZONE C: ROAD STRUCTURE.

13.8.5. REQUIRED BACKFILL PROPERTIES

13.8.5.1. IN-SITU SOIL - NATURAL GROUND IS TO BE SUFFICIENTLY STABLE TO ALLOW EFFECTIVE SUPPORT TO THE PRECAST CONCRETE BRIDGE UNITS. AS A GUIDE, THE EXISTING NATURAL GROUND SHOULD BE OF SIMILAR QUALITY AND DENSITY TO ZONE B MATERIAL FOR MINIMUM LATERAL DIMENSION OF ONE BRIDGE SPAN OUTSIDE OF THE BRIDGE FOOTING.

13.8.5.2. ZONE A - ZONE A REQUIRES FILL MATERIAL WITH SPECIFICATIONS AND COMPACTING PROCEDURES EQUAL TO THAT FOR NORMAL ROAD EMBANKMENTS.

13.8.5.3. ZONE B - GENERALLY, SOILS SHALL BE REASONABLY FREE OF ORGANIC MATTER, AND, NEAR CONCRETE SURFACES, FREE OF STONES LARGER THAN 3" IN DIAMETER SEE CHARTS FOR DETAILED DESCRIPTIONS OF ACCEPTABLE SOILS.

13.8.5.4. ZONE C - ZONE C IS THE ROAD SECTION OF GRAVEL, ASPHALT OR CONCRETE BUILT IN COMPLIANCE WITH LOCAL ENGINEERING PRACTICES.

13.8.5.5. GEOTECHNICAL ENGINEER SHALL REVIEW GRADATIONS OF ALL INTERFACING MATERIALS AND, IF NECESSARY, RECOMMEND GEOTEXTILE FILTER FABRIC (PROVIDED BY CONTRACTOR)

13.8.6. PLACING AND COMPACTING BACKFILL
DUMPING FOR BACKFILLING IS NOT ALLOWED ANY NEARER THAN 3'-0" FROM THE BRIDGE LEG.

THE FILL MUST BE PLACED AND COMPACTED IN LAYERS NOT EXCEEDING 8". THE MAXIMUM DIFFERENCE IN THE SURFACE LEVELS OF THE FILL ON OPPOSITE SIDES OF THE BRIDGE MUST NOT EXCEED 2'-0".

THE FILL BEHIND WINGWALLS MUST BE PLACED AT THE SAME TIME AS THAT OF THE BRIDGE FILL. IT MUST BE PLACED IN PROGRESSIVELY PLACED HORIZONTAL LAYERS NOT EXCEEDING 8" PER LAYER.

THE BACKFILL OF ZONE B SHALL BE COMPACTED TO A MINIMUM DENSITY OF 95% OF THE STANDARD PROCTOR, AS REQUIRED BY AASHTO T-99.

SOIL WITHIN 1'-0" OF CONCRETE SURFACES SHOULD BE HAND-COMPACTED. ELSEWHERE, USE OF ROLLERS IS ACCEPTABLE. IF VIBRATING ROLLER-COMPACTORS ARE USED, THEY SHOULD NOT BE STARTED OR STOPPED WITHIN ZONE B AND THE VIBRATION FREQUENCY SHOULD BE AT LEAST 30 REVOLUTIONS PER SECOND.

THE BACKFILL MATERIAL AND COMPACTING BEHIND WINGWALLS SHOULD SATISFY THE CRITERIA FOR THE BRIDGE BACKFILL, ZONE B.

BACKFILL AGAINST A WATERPROOFED SURFACE SHALL BE PLACED CAREFULLY TO AVOID DAMAGE TO THE WATERPROOFING MATERIAL.

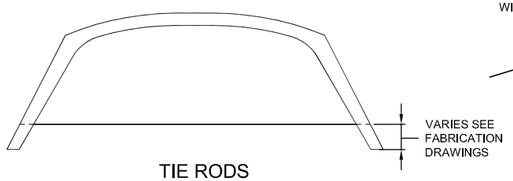
13.8.7. BRIDGE UNITS
FOR FILL HEIGHTS OVER 12'-0", NO BACKFILLING MAY BEGIN UNTIL A BACKFILL COMPACTION TESTING PLAN HAS BEEN COORDINATED WITH AND APPROVED BY CONTECH® BRIDGE SOLUTIONS. COST OF THE BACKFILL COMPACTION TESTING SHALL BE INCLUDED IN THE COST OF THE PRECAST UNITS. THIS INCLUDED COST APPLIES ONLY TO PROJECTS WITH FILL HEIGHTS OVER 12'-0" (AS MEASURED FROM TOP CROWN OF BRIDGE TO FINISHED GRADE).

13.8.8. WINGWALLS
BACKFILL IN FRONT OF WINGWALLS SHALL BE CARRIED TO GROUND LINES SHOWN IN THE PLANS.

13.8.9. MONITORING
THE CONTRACTOR SHALL CHECK SETTLEMENTS AND HORIZONTAL DISPLACEMENT OF FOUNDATION TO ENSURE THAT THEY ARE WITHIN THE ALLOWABLE LIMIT PROVIDED BY THE ENGINEER. THESE MEASUREMENTS SHOULD GIVE AN INDICATION OF THE SETTLEMENTS AND DEFORMATIONS ALONG THE LENGTH OF THE FOUNDATIONS.

THE FIRST MEASUREMENT ROW SHOULD TAKE PLACE AFTER THE ERECTION OF ALL PRECAST BRIDGE SYSTEM ELEMENTS, A SECOND AFTER COMPLETION OF BACKFILLING, AND A THIRD BEFORE OPENING OF THE BRIDGE TO TRAFFIC. FURTHER MEASUREMENTS MAY BE MADE ACCORDING TO LOCAL CONDITIONS.

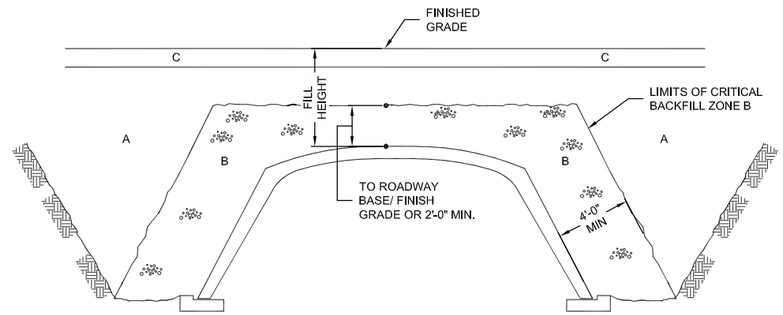
THE MAXIMUM DIFFERENCE IN VERTICAL DISPLACEMENTS 'V' SHOULD NOT EXCEED 1" ALONG THE LENGTH OF ONE FOUNDATION.



TIE RODS

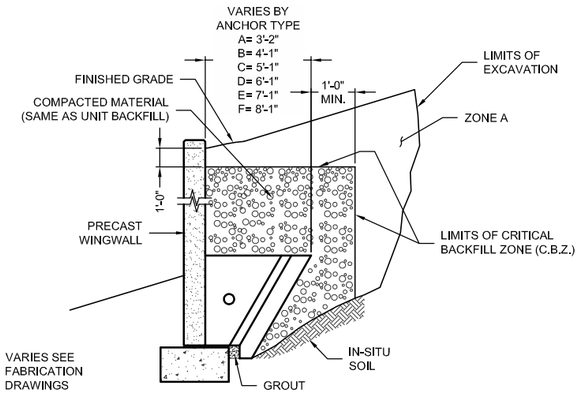
ACCEPTABLE SOILS FOR USE IN ZONE B BACKFILL

TYPICAL USCS MATERIALS	AASHTO GROUP	AASHTO SUBGROUP	PERCENT PASSING US SIEVE NO.			CHARACTER OF FRACTION PASSING NO. 40 SIEVE		SOIL DESRIPTION
			#10	#40	#200	LIQUID LIMIT	PLASTICITY INDEX	
GW, GP, SP	A1	A-1a	50 MAX	30 MAX	15 MAX		6 MAX	LARGELY GRAVEL BUT CAN INCLUDE SAND AND FINES
GM, SW, SP, SM		A-1b		50 MAX	25 MAX		6 MAX	GRAVELLY SAND OR GRADED SAND, MAY INCLUDE FINES
GM, SM, ML, SP, GP	A2	A-2-4			35 MAX	40 MAX	10 MAX	SANDS, GRAVELS WITH LOW-PLASTICITY SILT FINES
SC, GC, GM		A-2-5			35 MAX	41 MIN	10 MAX	SANDS, GRAVELS WITH PLASTIC SILT FINES
SP, SM, SW	A3			51 MIN	10 MAX		NON-PLASTIC	FINE SANDS
ML, SM, SC	A4				36 MIN	40 MAX	10 MAX	LOW-COMPRESSIBILTY SILTS



SPAN	FILL HEIGHT	ACCEPTABLE MATERIAL INSIDE ZONE B
≤ 24'-0"	≥ 12'-0"	A1, A3
≤ 24'-0"	< 12'-0"	A1, A2, A3, A4
> 24'-0"	ALL	A1, A3

BACKFILL REQUIREMENTS



WALL BACKFILL REQUIREMENTS

MARK	DATE	REVISION DESCRIPTION	BY
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CON/SPAN® ARCH-SERIES

PROPOSAL DRAWING

3000W Badger Creek Bridge
NOT FOR CONSTRUCTION

Tetonia, ID

PROJECT No.:	SEQ. No.:	DATE:
478150	010	4/5/2013
DESIGNED: KKV	DRAWN: N/A	
CHECKED: JL	APPROVED: XXX	
SHEET NO.: 5 OF 5		

BADGER CREEK RESTORATION PLAN
COUNTY ROAD NORTH 3000 WEST
TETON COUNTY, IDAHO

Prepared For

Teton County Engineering Department

Teton County Courthouse, 150 Courthouse Drive – Room 117, Driggs, ID 83422

Prepared By

research & consulting inc.
Biota

P. O. Box 8578, 140 E. Broadway, Suite 23, Jackson, WY 83002

April 5, 2013

CONTENTS

FIGURES

TABLES

- BADGER CREEK RESTORATION PLAN -
COUNTY ROAD NORTH 3000 WEST
TETON COUNTY, IDAHO

INTRODUCTION

Biota Research and Consulting, Inc. (Biota) has been retained by the Teton County Engineering Department to complete a stabilization and restoration plan for the reach of Badger Creek located proximate to County Road North 3000 West (CR N3000W). The Badger Creek N3000W Project is an effort to protect county transportation infrastructure and the health, safety, and welfare of the community. The primary strategy to meet project objectives is to restore stable channel form in Badger Creek in order to regain fluvial functions associated with peak flow conveyance, sediment transport continuity, and stable hydraulic conditions.

The proposed stabilization plan includes a discussion of morphologic assessments within the project area; hydrologic investigations pertinent to the reach; sediment transport analyses; and identification and discussion of specific restoration treatments and strategies. These materials are intended to be used for regulatory agency review and permitting; collaboration efforts with project proponents; project implementation and construction; post-construction monitoring; identification of adaptive management strategies; and long-term assessment of project success.

PROJECT AREA

The Badger Creek project area is located roughly 10 miles north of Driggs in Teton County, Idaho (T06N, R45E, Sec 8 & 9, Sheet TL-1). The project area includes an approximately 3,000-ft reach of Badger Creek located immediately upstream of the County Road North 3000 West bridge. The project reach extends beyond the Teton County road easement onto property owned by John H. Steele Trust and King Family Enterprises, LLC. The project area focus is a channel divergence located approximately 2,200 feet upstream of County Road North 3000 West, where the historic primary channel of Badger Creek was recently abandoned when a (secondary) side channel captured the majority of Badger Creek flows.

EXISTING CONDITIONS

HYDROLOGIC REGIME

The hydrologic regime within the project area was investigated using multiple analytical techniques that incorporate hydrologic modeling, channel morphology, and hydraulics. Fundamental investigations involved identification of bankfull discharge, which is the design discharge used for site assessment, analysis, and design efforts. Bankfull discharge is the flow rate and bankfull stage is the corresponding water surface elevation at which instream water escapes the active channel and inundates the floodplain (when incipient flooding occurs). There is natural variability in the recurrence interval of bankfull discharge between sites that, according to Shields et al. (2003), ranges from 1 to 2.5 years. However, professional experience in this region suggests that a reasonable estimation of bankfull discharge recurrence interval is 1.1-1.5 years. Bankfull discharge was selected as the primary hydrologic parameter for assessment and design purposes because it can be identified and corroborated through field investigations, as opposed to potential alternate parameters of effective discharge (e.g., the flow

rate that transports the most sediment) or dominant discharge (e.g., the flow rate responsible for the stable morphology) that can only be derived through modeling, without real world corroboration.

Initial investigations were completed using the U.S. Geological Survey (USGS) StreamStats software which uses regional regression equations to calculate flow statistics based on empirical correlations between discharge and catchment attributes. Badger Creek flows westerly out of the Teton Mountain Range, and has a hydrologic regime characteristic of a flashy snow-melt dominated system. The project area catchment is approximately 31.6 square miles, has a peak elevation of approximately 10,300 feet, and has a mean basin elevation of 7,330 feet. StreamStats modeling predicts:

1) A 1.5-year recurrence interval discharge (a statistical approximately of bankfull discharge) at the downstream end of the project area of 175 cfs (Fig. 1);
2) A 100-year recurrence interval discharge of 517 cfs (Fig. 1);
3) Median average monthly discharge with 20% and 80% exceedance values (Fig. 2); and
4) A peak average monthly discharge of 126 cfs; a minimum average monthly discharge of 16.1 cfs; and a mean annual discharge in the project area reach of 46.5 cfs.

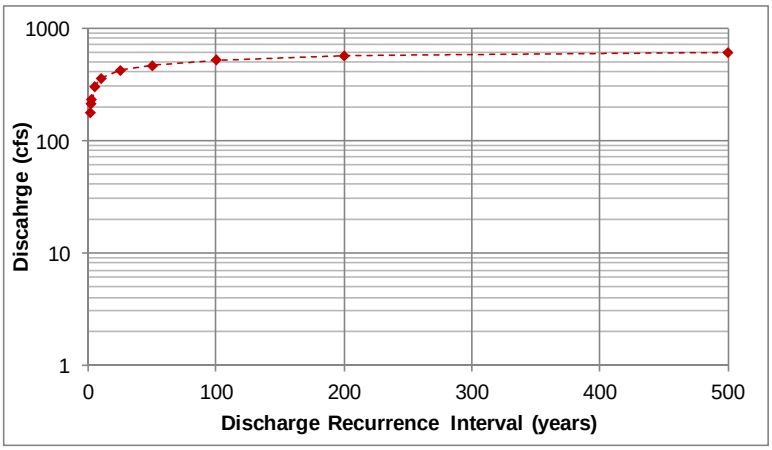

Figure 1. StreamStats modeling output depicting recurrence interval discharge rates within Badger Creek N3000W project area, Teton County, Idaho.

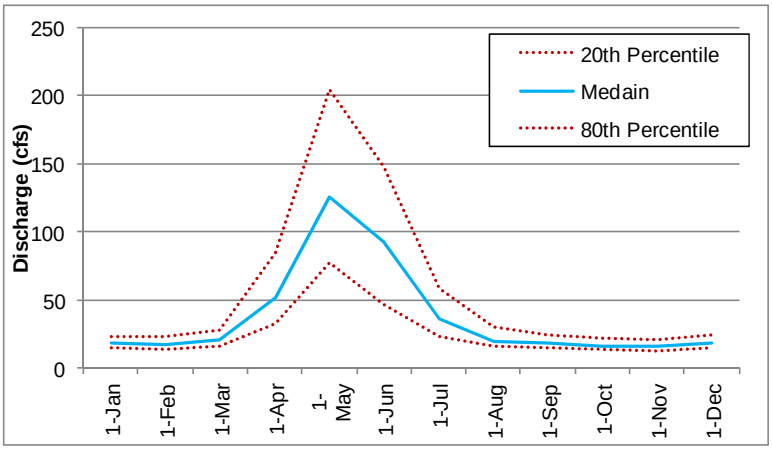

Figure 2. StreamStats modeling output depicting median monthly discharge with 20% and 80% values in Badger Creek N3000W project area, Teton County, Idaho.

Estimation of bankfull discharge was further refined using hydraulic modeling of open channel flow conditions that incorporate field-measured morphologic and sediment data (floodplain elevation, bankfull indicators, channel dimension and profile, sediment size class distribution, hydraulic roughness). Hydraulic analysis techniques included:

1. Determination of channel roughness based on hydraulic radius and substrate size class distribution (known as relative roughness), and incorporation of cross sectional area and slope to derive bankfull discharge.

2. Determination of channel roughness based on an empirical correlation between relative roughness, friction factor, and roughness coefficient, then incorporation of cross sectional area and slope to derive bankfull discharge.

3. Determination of channel roughness based on an empirical correlation between Rosgen stream type and Manning's n-value, and incorporation of cross sectional area and slope to derive bankfull discharge.

4. Determination of channel roughness based on empirical attributes of high boundary roughness large substrate dominated streams as outlined in Jarrett (1990), and incorporation of cross sectional area and slope to derive bankfull discharge.

These 4 approaches were used to analyze 2 distinct reference reach riffle bed features surveyed in 2012. The results of these analyses are depicted in Table 1. The hydraulic calculation results of bankfull discharge from both reference riffles using the 4 methodologies are similar. The average value from the 2 reference sections was identified as the bankfull (and design) discharge because results are in close agreement and are based upon measured channel morphology and hydraulics; the StreamStats model output 1.5-year recurrence interval flow of 175 cfs was not incorporated because the regression models do not appear to accurately reflect site conditions in this instance. A bankfull discharge value of 315 cfs was identified as the design discharge.

Table 1. Bankfull discharge as determined through multiple analysis techniques, Badger Creek N3000W project area, Teton County, Idaho.

Analysis Technique	Bankfull Discharge (cfs)
Regional Regression Analyses	
StreamStats Software, 1.5-Year Recurrence Interval	**175**
Hydraulic Analyses, Reference Section 1	
1. Relative Roughness	308
2. Relative Roughness-Friction Factor Empirical Relation	308
3. Stream Type-Roughness Empirical Relation	382
4. Rough Boundary Streams Empirical Relation	309
Average	**327**
Hydraulic Analyses, Reference Section 2	
1. Relative Roughness	307
2. Relative Roughness-Friction Factor Empirical Relation	278
3. Stream Type-Roughness Empirical Relation	345
4. Rough Boundary Streams Empirical Relation	279
Average	**302**
Design Bankfull Discharge	**315**

Flow duration characteristics within the project area were investigated in order to provide hydrologic information pertinent to sediment transport capacity, instream flow variability, and hydraulic conditions. The Badger Creek project area is an ungauged stream reach with no known measured or recorded flow dataset. Therefore, a flow duration curve was developed for the project area reach using a dimensionless correlation approach (Rosgen 2010). A flow duration curve was compiled using mean daily discharge data from the USGS Falls River gauge #13046995, which reflects conditions in the same region as the project area. The flow duration curve was compiled using only complete years of record from the Falls River gauge site. A dimensionless flow duration curve was then generated based on the identified bankfull discharge at the Falls River gauge site, and was correlated to the ungauged Badger Creek project area based upon field estimated bankfull discharge at the site. The resulting flow duration curve describes hydrologic conditions within the project area and was used while analyzing sediment transport capacity and total available hydrologic inputs.

Upstream diversions may unpredictably influence discharge through the Badger Creek N3000W project area. However, the estimation of project area bankfull discharge and the calculated flow duration attributes are based upon existing stable channel morphology, which was created and maintained by current hydrologic and sediment inputs to the reach. The influence of upstream diversions is therefore incorporated into these analyses, and the resultant flow duration curve (Figure 3) reflects existing hydrologic conditions within the project area.

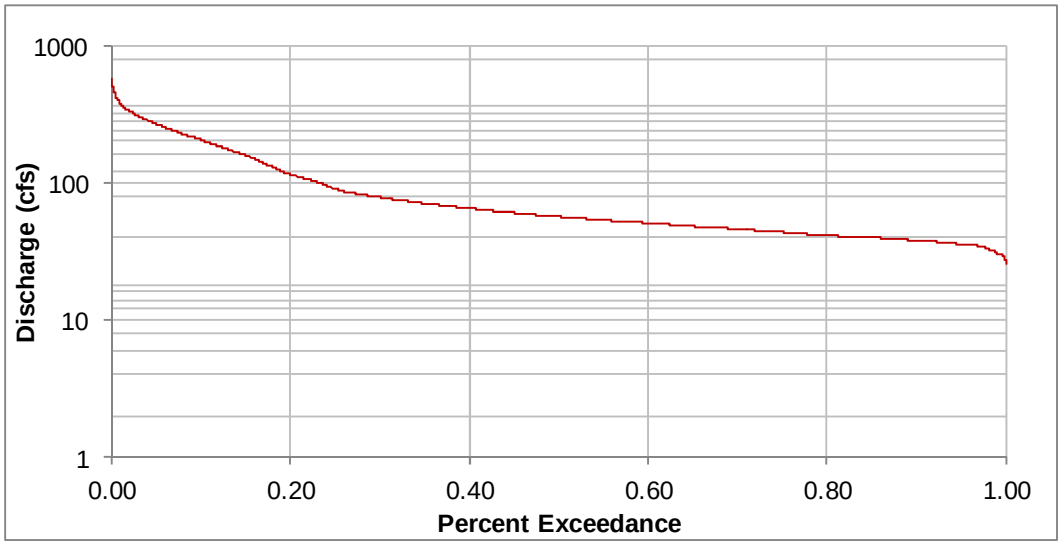

Figure 3. Mean daily discharge flow duration curve developed for Badger Creek N3000W project area, Teton County, Idaho.

CHANNEL MORPHOLOGY

A morphologic survey of the project area reach was performed in the spring of 2012. Morphologic survey data were used to assess channel dimension, planform, and profile through the reach. Professional grade GPS survey equipment and laser level transit survey equipment were used to measure water surface elevation, thalweg, bankfull indicators, floodplain and terrace features, top of bank elevations, channel geometry, local slope, and planform within the project reach (Figure 4). The survey included approximately 3,000 linear feet of channel, extending from below County Road North 3000 West upstream through the project area reach, past the side channel divergence, and through a relatively stable single thread meandering reach of the creek.

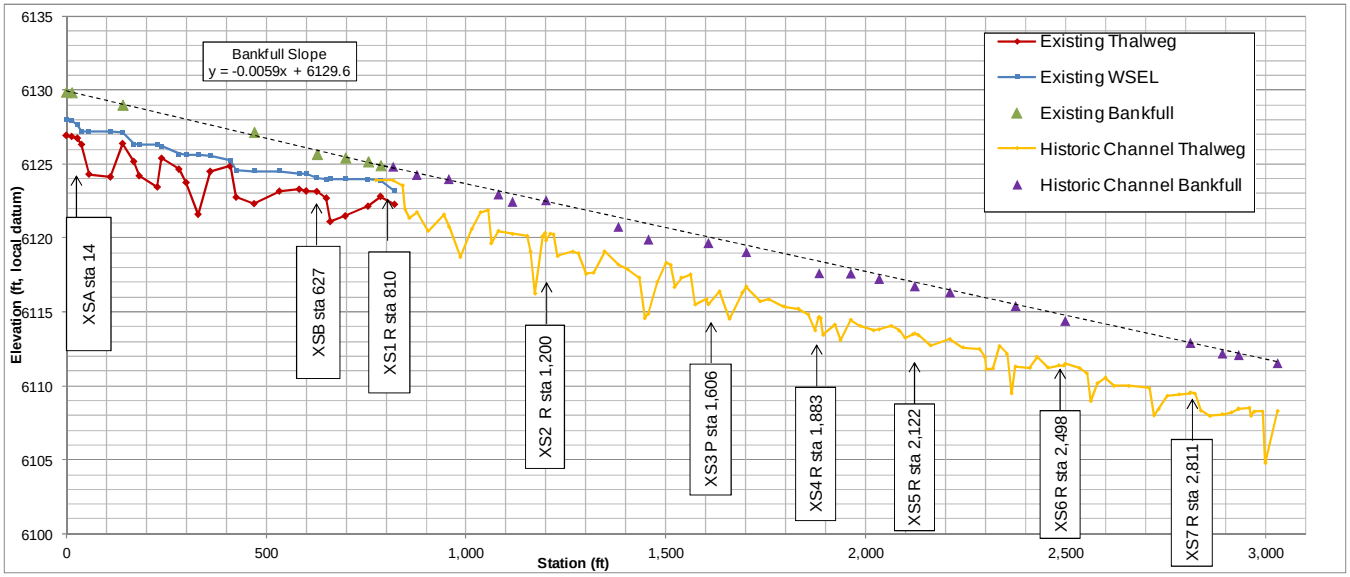

Figure 4. Measured longitudinal profile of primary channel in the Badger Creek N3000W project area, Teton County, Idaho.

The project area is located in a Rosgen valley types VIII characterized as a gently sloped broad valley with alluvial terraces and floodplains. The natural stable channel forms appropriate within this setting are E-type or C-type channels that are slightly entrenched, meandering, riffle-pool bedform streams. Morphologic channel data indicate that the dominant channel form in the Badger Creek project area is that of a D-type channel, characterized by a braided, or multi-channel, system. This morphologic condition is unstable and dysfunctional, as evidenced by the following:

1. The side channel recently captured the main flow of Badger Creek;

2. The historic primary channel experiences seasonal dewatering due to the side channel capture;

3. Severe flooding occurs in the reach (even during lower return interval flow events) and regularly damages the county road and threatens infrastructure in the area;

4. A legal point of diversion located along the historic primary channel downstream of the project area no longer receives adequate hydrologic support.

When considered independently of secondary and tertiary channels, the primary channel has attributes of a C-type channel that is slightly entrenched, has high width-depth ratio, and moderate sinuosity. The typical channel geometry of the primary channel of Badger Creek is depicted in Figure 5. The C-type primary channel has an entrenchment ratio greater than 2.2, a width-depth ratio that ranges from 20 to 50, sinuosity of 1.7, and a functional connected floodplain.

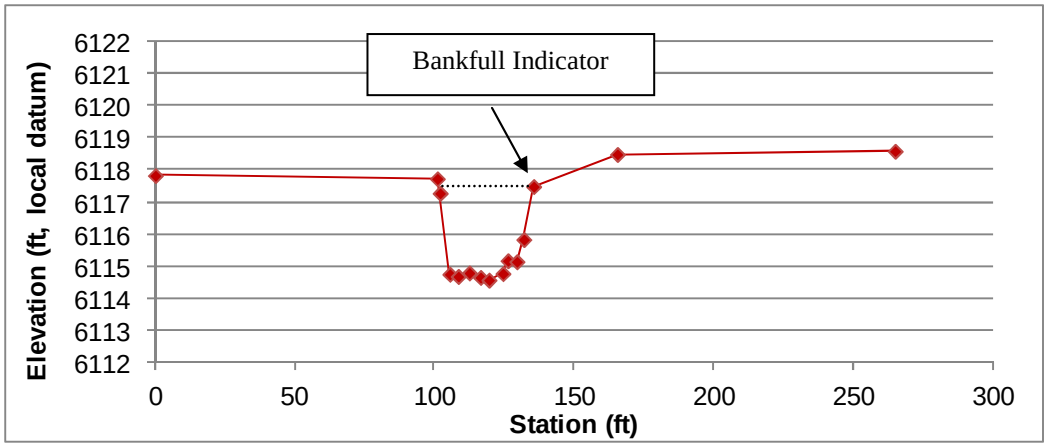

Figure 5. Primary channel cross section with Rosgen C-type channel morphology, Badger Creek N3000W project area, Teton County, Idaho.

SEDIMENT ATTRIBUTES AND SEDIMENT TRANSPORT

Sediment data were collected as part of the morphologic assessment, and included sampling active bed and bar material within and upstream of the reach. The active bed sediment sample was collected from multiple riffle bed features, was collected in accordance with the Wohlman pebble count protocol, and represents the measured B-axis of each particle. Bar material samples were collected from multiple locations within the project reach, and each bar was sampled at a point located in the downstream 1/3 of the feature at an elevation midway between the thalweg and bankfull. Each sample was sieved using a standard sieve set, and the relative weights of each size class were used during analyses. Figure 6 depicts the percent by size class of the bed and bar samples, and Figure 7 depicts the cumulative percent by size of the bed and bar samples. The active bed sediment sample median particle size was 90.5 mm and the maximum particle size was 200 mm. The bar material sample reflects available bedload within the reach and was comprised of smaller diameter particles with a median particle size of 24 mm and a maximum particle size of 84 mm.

Sediment transport competence within the upper abandoned main channel was analyzed using active bed particle size distribution, bar material particle size distribution, and existing channel morphology. Calculated bankfull *dimensionless* shear stress in the main channel is 0.0243. When input into a sediment transport competence model, the dimensionless shear stress is associated with hydraulic conditions that are insufficient to transport all size classes of the available bedload supply. This sediment transport incompetence extends from the side channel divergence for a distance of 950 ft downstream. Efforts to stabilize or restore functionality to the project reach must address the inability of the historic primary channel to transport all sizes of material comprising the bedload supply. From 950 ft below the side channel divergence downstream to the county bridge, the channel regains sediment transport competence and has bankfull hydraulic conditions sufficient to mobilize all size classes of the available bedload supply.

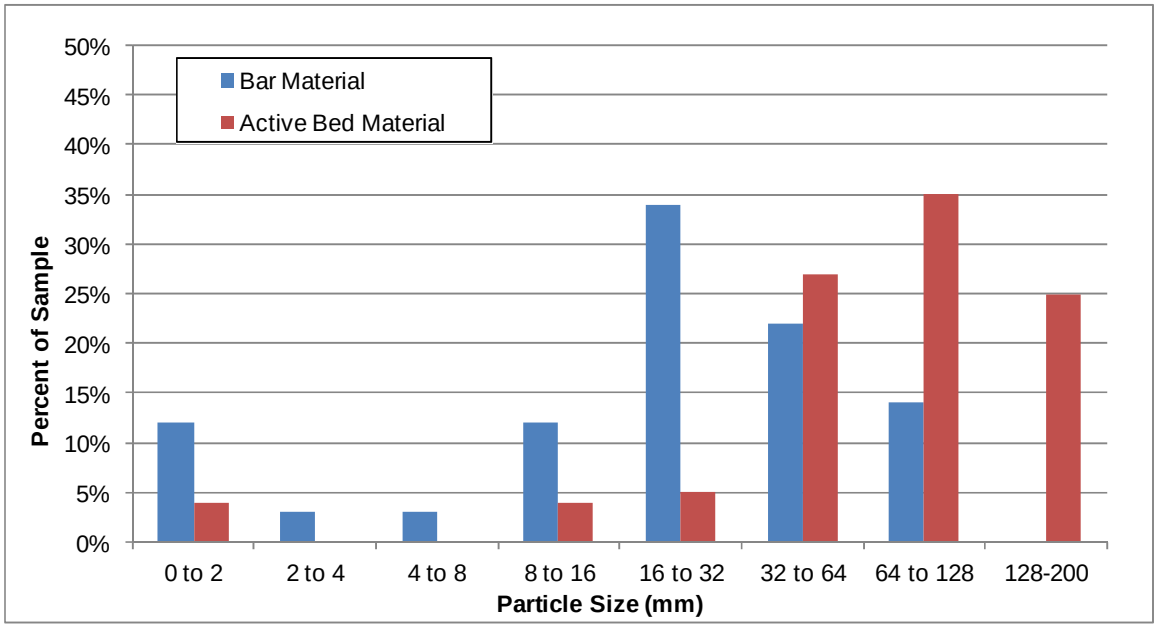

Figure 6. Active bed and bar sample percent by size class, Badger Creek N3000W project area, Teton County, Idaho.

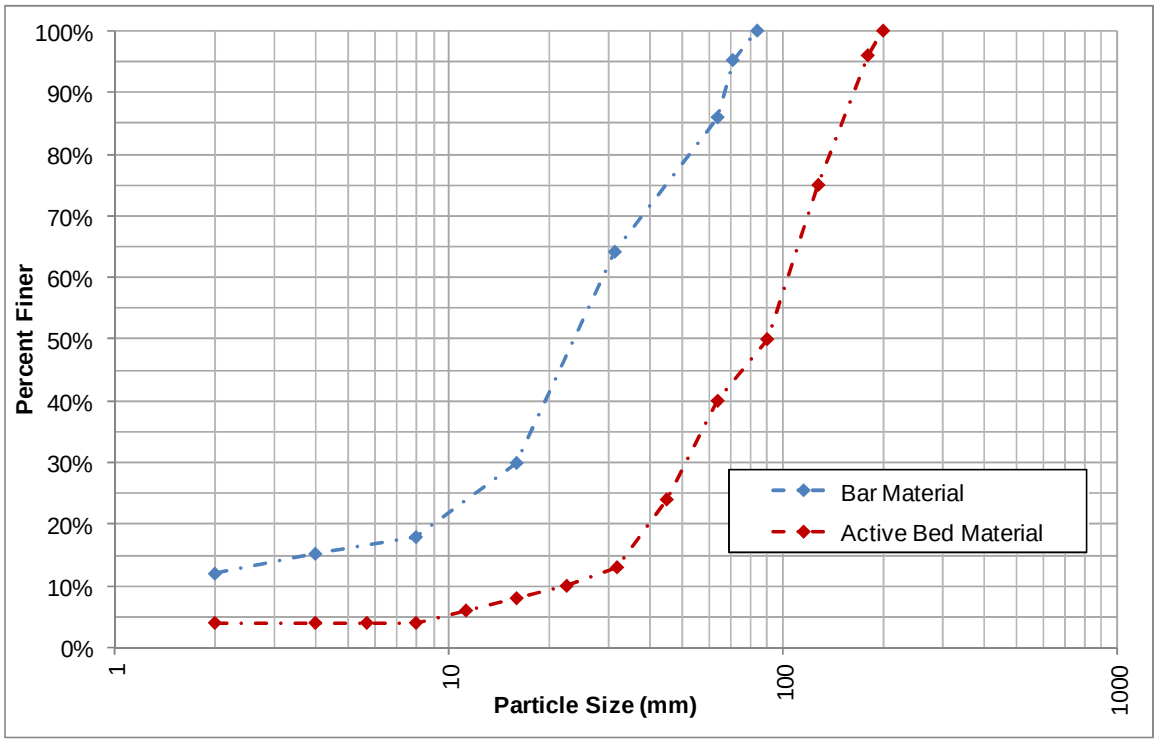

Figure 7. Active bed and bar sample cumulative percent smaller Badger Creek N3000W project area, Teton County, Idaho.

The morphological assessment included identification of a supply reach located upstream of the project area. That supply reach channel is characterized as a C-type channel with stable morphology, connected floodplain, moderate width-depth ratio, and suitable aquatic habitat. Multiple riffle bed features were surveyed in that reach (examples are depicted in Figure 8), and hydraulic analyses revealed that the

reach has a width-depth ratio ranging from 37 to 42, bankfull cross sectional area ranging from 96 to 106 square feet, and bankfull width ranging from 60 to 67 feet.

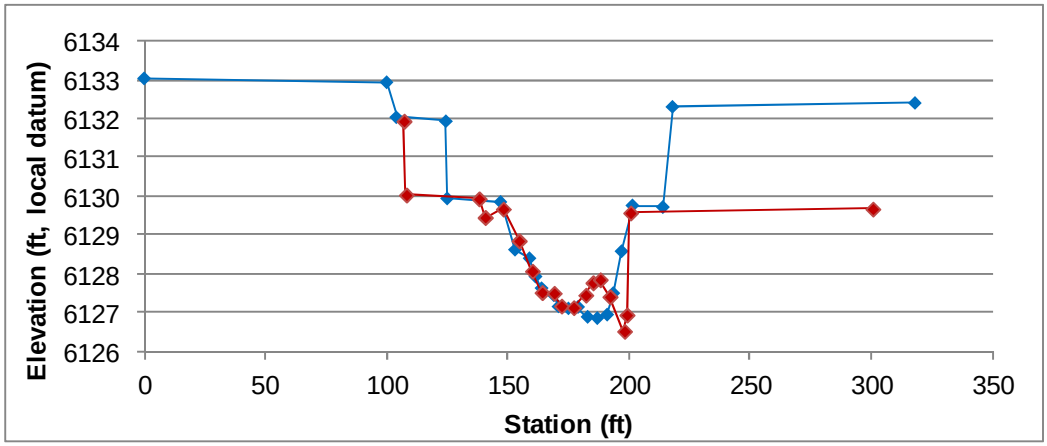

Figure 8. Upstream supply reach riffle cross sections, Badger Creek N3000W project area, Teton County, Idaho.

The supply reach channel geometry was used in conjunction with sampled bed material and bar material in order to calculate bankfull bedload transport rate in 2 distinct riffle bed features using multiple established methods, as outlined in Pitlick et al. (2009). The results of the calculations are depicted in Table 2. Bedload transport is highly variable in space and time, and published literature acknowledges that both analytical calculations *and* field measurements of bedload transport typically demonstrate variability of an order of magnitude or more. To account for variability in the analyses, results from the bedload transport rate calculations were averaged and the resulting bankfull bedload transport rate of 0.278 kg/min was used for analysis and design purposes. The bankfull suspended load was determined to be 93.4 mg/L based on empirical data and regional regression data (Simon et al., 2003).

Table 2. Bankfull bedload sediment transport rates, Badger Creek N3000W project area, Teton County, Idaho.

Location and Calculation Methodology	Bankfull Bedload Transport Rate (kg/min)
Supply XS1, Wilcock and Crowe, 2003	0.547
Supply XS1, Parker ,1990	0.025
Supply XS1 Average	0.286
Supply XS2, Wilcock and Crowe, 2003	0.519
Supply XS2, Parker ,1990	0.022
Supply XS2 Average	0.270
Supply Reach Average	**0.278**

The bankfull bedload and suspended sediment transport rates were used to scale dimensionless sediment transport rating curves to the project area reach (Rosgen 2010). Annual sediment load delivered to the project area was calculated by applying the Badger Creek mean daily flow duration curve to the sediment transport-rating curves. Annual sediment transport capacities of the supply and impaired reaches were then calculated by quantifying the hydraulic geometry of individual riffle sections, calculating stream power by discharge at each riffle section, converting the dimensional sediment transport rating curves to reflect discharge vs. stream power, and then applying the flow duration curve to quantify total annual transport capacity at each riffle section. These analyses were completed for 6 distinct riffles within the primary channel reach, and results are depicted in Table 3.

Table 3. Total annual sediment transport capacity by section in the Badger Creek N3000W project area, Teton County, Idaho.

Section ID	Total Annual Sediment Transport Capacity (tons)	Net Capacity (tons/year)
Supply Reach XS1	2,136	--
Supply Reach XS2	2,134	--
Supply Reach Average	**2,135**	--
Impaired Reach Riffle XS1	979	-1,156
Impaired Reach Riffle XS2	1,245	-890
Impaired Reach Pool XS3	(n/a)	(n/a)
Impaired Reach Riffle XS4	2,497	362
Impaired Reach Riffle XS5	2,340	205
Impaired Reach Riffle XS6	2,889	754
Impaired Reach Riffle XS7	2,659	524

Results indicate that the supply reach delivers a total annual sediment load of 2,135 tons to the project area reach. The current condition of the historic primary channel is not adequate to pass that annual sediment load through the reach due to inappropriate channel morphology. Sections XS1 and XS2 in the historic primary channel downstream of the side channel divergence have total annual sediment transport capacity of only 979 and 1,245 tons, respectively; neither section has adequate capacity to transport the total annual sediment supply of 2,135 tons. The surplus annual sediment load (1,156 tons in XS1, and 890 tons in XS2) is therefore deposited as mid-channel bars and deflectors. Those depositional features cumulatively reduce channel capacity and increase flood potential. Individual depositional features also redirect peak flows and increase near bank shear stress which, in turn, perpetuates additional severe bank erosion and sediment input into the watershed. The sediment recruited through bank erosion then contributes to the total sediment load, which already exceeds capacity, and this process is continued through a positive feedback loop. Efforts to stabilize or restore functionality to the project reach must address the sediment transport bottleneck located in the historic primary channel immediately downstream of the side channel divergence.

RESTORATION DESIGN

Analyses indicate that fluvial processes in the Badger Creek project area reach are impaired. Expressed symptoms of system impairment include localized deposition and channel filling, bank erosion and lateral channel migration, loss of riparian vegetation, heightened propensity for debris jams, side channel capture and main channel abandonment, and the loss of functionality at an established point of diversion located in the historic primary channel downstream of the project area. In an attempt to correct these problems, an active restoration plan has been generated.

GOALS AND OBJECTIVES

The proposed project has been designed to restore channel form and function. Specific project goals include:

1) Restore Badger Creek fluvial processes prior to, or simultaneously with, a bridge improvement project to ensure the long term success of that infrastructure improvement plan;

2) Ensure the (northern) primary channel conveys the sediment supply and the typical flows (from base flow to the design discharge);

3) Ensure an appropriate (southern) secondary channel flow regime to maintain ecological functions and riparian conditions;

4) Ensure that surface water is conveyed through the northern channel toward the downstream point of diversion in order to maintain diversion abilities and reduce the need for future anthropogenic channel manipulations;

5) Restore sediment transport continuity through the reach;

6) Stabilize severe stream bank erosion and curb ongoing lateral channel migration where it jeopardizes project success;

7) Maintain conveyance for all expected discharge rates (including bankfull, 10-year, 50-year, and 100-year flows);

8) Ensure that floodplain connectivity occurs at the bankfull discharge and stage;

9) Improve channel dynamics and function;

10) Provide for continued irrigation diversion activities in a fashion that does not compromise channel stabilization or restoration activities.

MORPHOLOGIC RESTORATION

The iterative restoration design process identified stable channel morphology based upon existing hydrologic regime, sediment inputs, and site conditions. A "Natural Channel Design" approach was applied to define appropriate morphology for the project area reach using analogy, empirical, and analytical design techniques. Analogy techniques included replicating reference reach channel morphology within the project area. Empirical techniques included designing the restored channel form based upon hydraulic geometry and morphologic parameters of regional stable watercourses. Analytical techniques included ensuring the design achieves desired bankfull and peak flow hydraulic conditions, sediment transport competence, sediment transport capacity, suitable bank stability, and appropriate hydraulic conditions.

Treatments have been designed to restore channel morphology in the upstream 950 ft of the historic primary channel, to reduce the capacity of the side channel inlet, to stabilize eroding stream banks, and to provide channel stability proximate to the N3000W Road Bridge. In its entirety, the proposed Badger Creek N3000W Project would install 5 rock vane structures, 2 rock-log hybrid vanes, root wad and log revetments, and bioengineering treatments to establish deep-rooted woody vegetation (Sheets SP-1 to SP-3). Implementation of these treatments will restore stable channel geometry, profile, and boundary conditions while achieving sediment transport continuity and peak flow capacity within the reach. Rock structures will be constructed of 2.5 to 3.5-foot diameter rock with footers to resist erosion, undermining, and mobilization; these structures have been designed using peer reviewed and accepted fluvial references and published literature (NRCS Engineering Field Handbook; NRCS Technical Notes; various geomorphic publications). Root wad and log revetments will be constructed using logs installed in various configurations. Bank stabilization treatments will incorporate log, organic supplies, and live plant materials in precise configurations using techniques described in the *Streambank Soil Bioengineering Field Guide* (Hoag 2002).

Stabilization treatments will discharge 293 cy of 2.5 to 3.5-foot diameter boulders below the ordinary high water mark for rock and hybrid vanes. Bank stabilization treatments will include placement of root

wad and log revetments along 900 feet of bank. Stingers and other bioengineering treatments will be installed in conjunction with all bank stabilization treatments including wood revetments and rock vane bank keys. Shaping of channel geometry will occur within 950 ft of the primary channel immediately downstream of the side channel divergence. The side channel inlet will be rebuilt and graded to the local bankfull elevation, the constructed bank will be stabilized with root wad revetments, and downstream grade control will be installed to prevent headward erosion. This configuration will ensure that the side channel conveys flood water when the stage exceeds the bankfull elevation, and will maintain the northern channel as the primary channel during all discharge levels. Treatment quantities and details are presented in Table 4 and in Sheets DT-1 through DT-6.

Table 4. Summary of proposed treatment quantities, Badger Creek N3000W Project Area, Teton County, Idaho.

Treatment	Quantity/Distance	Discharge Volume (cy)	Excavation Volume (cy)
Rock Vanes	n=4	236	--
J-Hook & Hybrid Vanes	n=3	57	--
Rootwad/Log Revetments	900 ft	--	--
Stinger Plantings (1/ft along revetments and bank keys)	1,150 ft	--	--
Channel Geometry Shaping	950 ft	--	1,197
Side Channel Inlet Grading	150 ft	780	--
Total Discharge Volume		**1,073**	--
Total Excavation Volume		--	**1,197**

The restoration design includes reconstructing stable channel geometry through channel shaping in areas where hydraulics maintained by the undersized bridge have resulted in unstable depositional features and channel filling. The restoration design will achieve a channel slope of 0.59%. Based upon this profile, the design bankfull channel geometry (width, max depth, mean depth, width/depth ratio) was specified to achieve stable form and function under current hydrologic and sediment conditions. The design channel morphology will achieve sediment transport capacity and competence (the ability to move all size classes and all volume of the supplied sediment load). Design cross sections are scaled based upon hydraulic geometry to ensure suitable stream power, and are specified for riffle and pool bed features located within the project reach (example in Figure 9; data on Sheets DT-4 and DT-6). Design channel profile is presented in Figure 10.

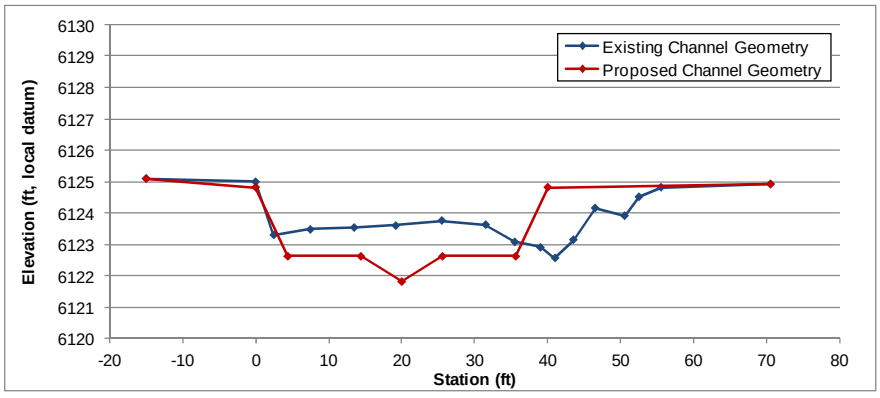

Figure 9. Existing and proposed channel geometry in a riffle bed feature Badger Creek N3000W Project Area, Teton County, Idaho.

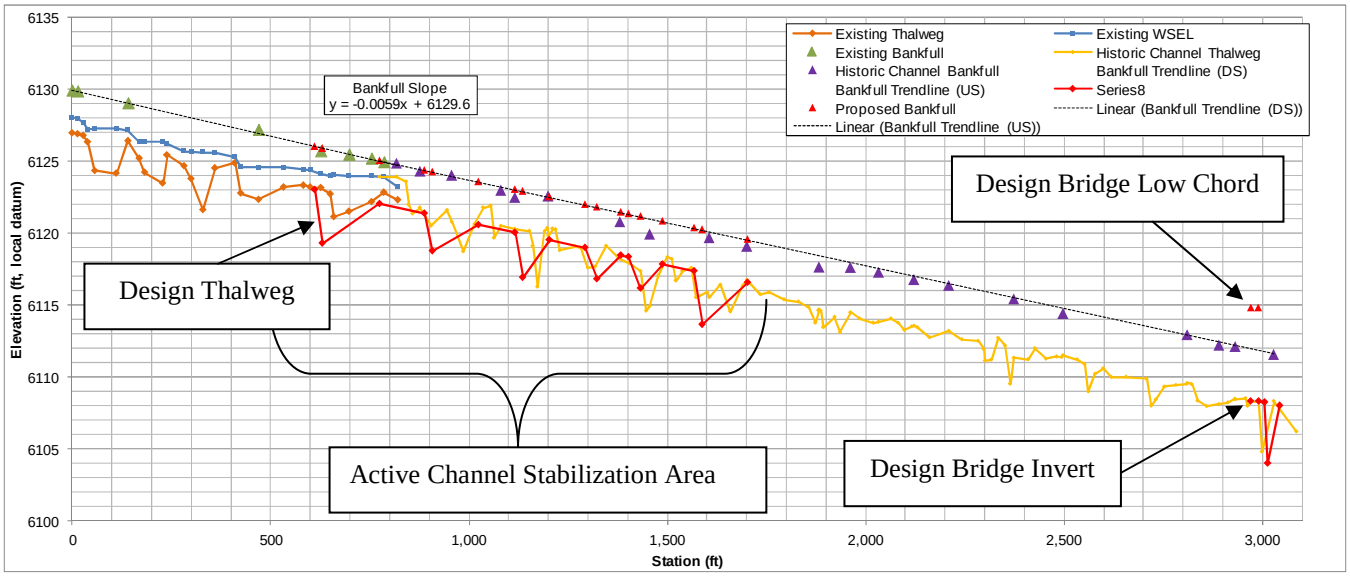

Figure 10. Existing and proposed channel profile, Badger Creek N3000W Project Area, Teton County, Idaho.

The construction of stable channel morphology, in conjunction with the installation of rock and log structures, will accomplish project objectives of channel stability, sediment transport, conveyance, and channel alignment. Specific treatments will introduce and maintain channel bed form, reduce near bank velocities and shear stress, decrease stream bank erosion hazard, maintain bankfull channel width-depth ratio, and achieve morphologic stability within the stream reach while maintaining the historic alignment of Badger Creek. These fluvial restoration and channel stabilization activities can be implemented prior to, or simultaneously with, the North 3000 West bridge improvement project. Channel treatments will help ensure the long term success of the county infrastructure improvement plan, and will benefit downstream irrigation diversion managers who presently struggle to access their allocated water resources due to channel instabilities and system degradation.

PROJECT IMPLEMENTATION

CONSTRUCTION TECHNIQUES AND REVEGETATION

All proposed construction activities will occur in a very sensitive manner, and any environmental damage will be minimized and reclaimed. Construction activities will be performed by an experienced contractor under the supervision and direction of the design consultant. Construction will occur during periods of low or no flow through the reach. All construction materials will be stored in upland staging areas, and materials excavated from within the project area will be disposed of at designated upland sites. All construction routes will be clearly marked and reclaimed following project completion.

Native woody plant species will be installed as live cuttings and clump transplants to stabilize banks and provide hydraulic roughness. All woody plant material will be harvested onsite, and species will likely include Geyer's willow (*Salix geyerana*), Booth's willow (*Salix boothii*), yellow willow (*Salix lutea*), Bebb's willow (*Salix bebbiana*), red-osier dogwood (*Cornus sericea*), narrowleaf cottonwood (*Populus angustifolia*), and black cottonwood (*Populus trichocarpa*). In order to ensure survival and long-term persistence, plant species will be installed in appropriate locations within riparian zone (i.e., bank zone, overbank zone, transitional zone, and upland zone), and live cuttings will be installed to sufficient depth to reach the lowest water table of the year.

Disturbed upland and transitional areas will consist of temporary haul roads, and equipment and material storage areas. Revegetation methods used to reclaim these areas will consist of broadcast seeding with native shrub, forb, and grass species common to the area. The reclamation seed mix (or mixes) will be based on the moisture regime of the impacted areas and will be comprised of some or all of the following species: western wheatgrass (*Pascopyrum smithii*), slender wheatgrass (*Agropyron trachycaulum*), mountain brome (*Bromus carinatus*), fowl bluegrass (*Poa palustris*), big bluegrass (*Poa secunda*), common yarrow (*Achillea millefolium*), snowberry (*Symphoricarpos albus*), Oregon grape (*Berberis repens*), shrubby cinquefoil (*Pentaphylloides fruiticosa*), woods rose (*Rosa woodsii*), sticky geranium (*Geranium viscosissimum*), and silky lupine (*Lupinus argentea*). Seeds will be distributed onto a prepared seed bed using a broadcast seeder and lightly raked into the surface layer of soil.

SUMMARY AND CONCLUSIONS

The Badger Creek N3000W project has been designed to restore fluvial processes while maintaining diversion functionality and protecting public health, safety, welfare, and infrastructure. The project reach of Badger Creek has experienced direct and indirect manipulations as the result of irrigation diversion management activities and downstream road and bridge infrastructure. Specific channel stabilization and restoration treatments have been designed to restore fluvial process and function based upon existing proximate infrastructure, downstream irrigation diversion activities, site specific hydrologic regime, local sediment inputs, and potential boundary conditions. The proposed plan will have considerable beneficial effects including reduced sediment inputs to the stream, improved stream stability, and improved fluvial processes and riparian ecology within the Badger Creek system.

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List of Attachments

Sheet TL-1 Title sheet, Badger Creek N3000W project area, Teton County, Idaho.

Sheet SL-1 Site location, Badger Creek N3000W project area, Teton County, Idaho.

Sheet SP-1 Site plan index, Badger Creek N3000W project area, Teton County, Idaho.

Sheet SP-2 Site plan sheet 1, Badger Creek N3000W project area, Teton County, Idaho.

Sheet SP-3 Site plan sheet 2, Badger Creek N3000W project area, Teton County, Idaho.

Sheet DT-1 Detail sheet rock vane, Badger Creek N3000W project area, Teton County, Idaho.

Sheet DT-2 Detail sheet J-hook and hybrid vanes, Badger Creek N3000W project area, Teton County, Idaho.

Sheet DT-3 Detail sheet rootwad/log revetments and bioengineering, Badger Creek N3000W project area, Teton County, Idaho.

Sheet DT-4 Design channel geometry, Badger Creek N3000W project area, Teton County, Idaho.

Sheet DT-5 Design channel profile sheet 1, Badger Creek N3000W project area, Teton County, Idaho.

Sheet DT-6 Design channel profile sheet 2, Badger Creek N3000W project area, Teton County, Idaho.

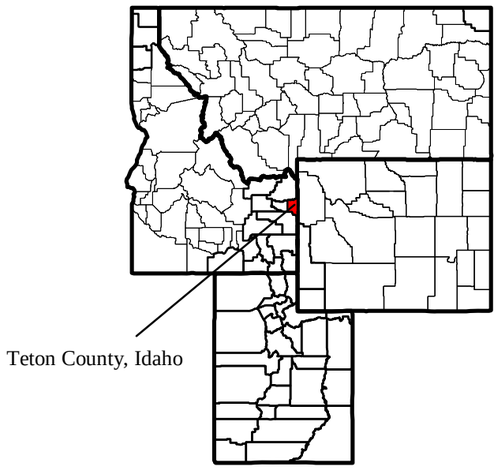
DESIGN DRAWINGS

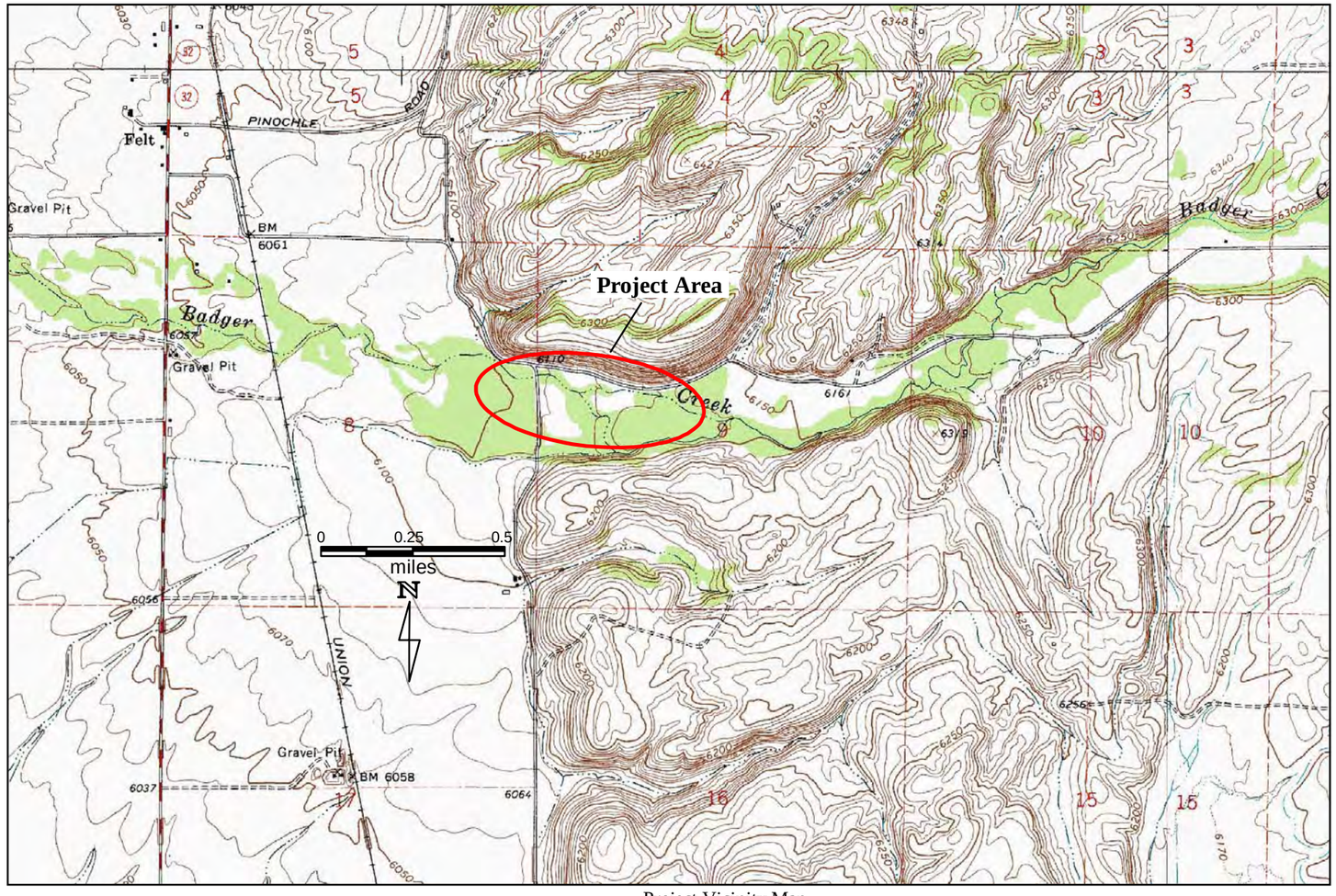
BADGER CREEK RESTORATION PROJECT
COUNTY ROAD NORTH 3000 WEST, TETON COUNTY, IDAHO

PREPARED FOR:

Teton County Engineering Department
Teton County Courthouse, 150 Courthouse Drive, Room 117, Driggs, ID 83422

DRAWING INDEX





Project Vicinity Map
USGS Quadrangle: Tetonia, ID; T06N, R45E, Sec 8 & 9
Scale: 1 inch = 2,000 feet

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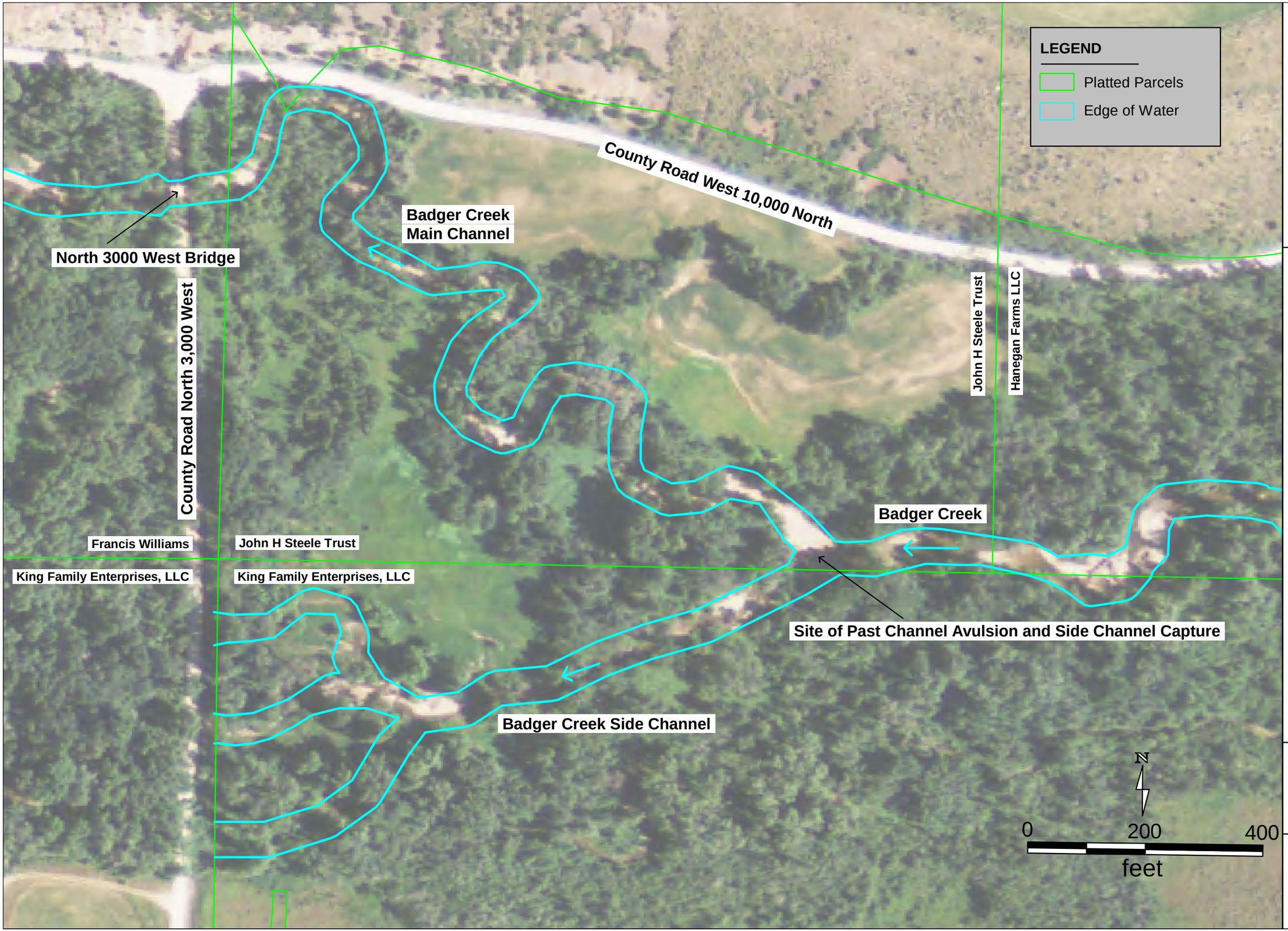
TITLE SHEET

Badger Creek Restoration Project
County Road North 3000 West
Teton County, Idaho

No: 1
Date: 4/2/2013
Description: Design Drawings

Drawing:

TL-1



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Biota
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Jackson, WY 83002; ph: 307-733-4216

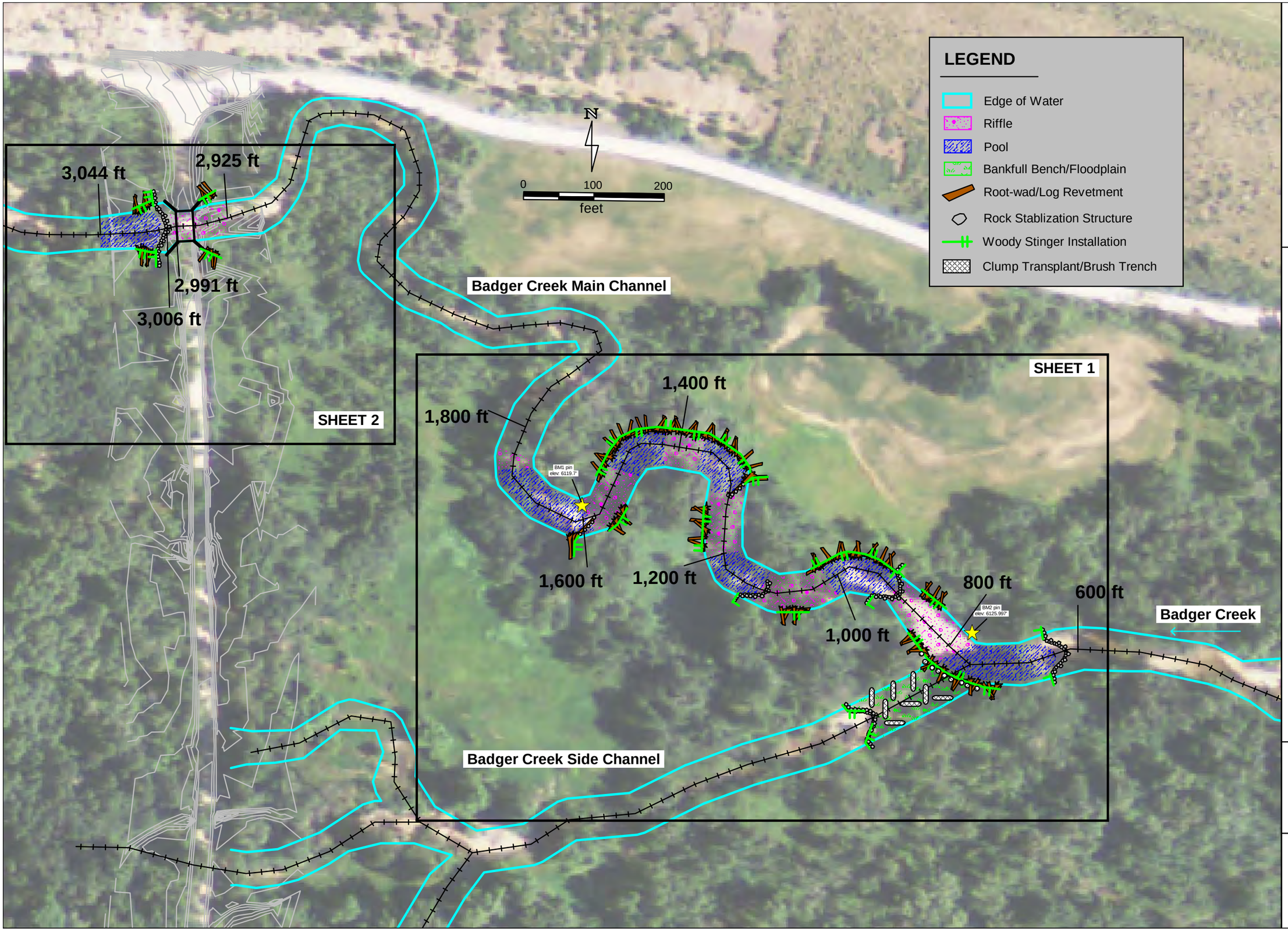
SITE LOCATION

Badger Creek Restoration Project
County Road North 3000 West
Teton County, Idaho

No: 1
Date: 4/2/2013
Description: DesignDrawings
2011 Aerial Photography

Drawing:

SL-1



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Biota
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Jackson, WY 83002; ph: 307-733-4216

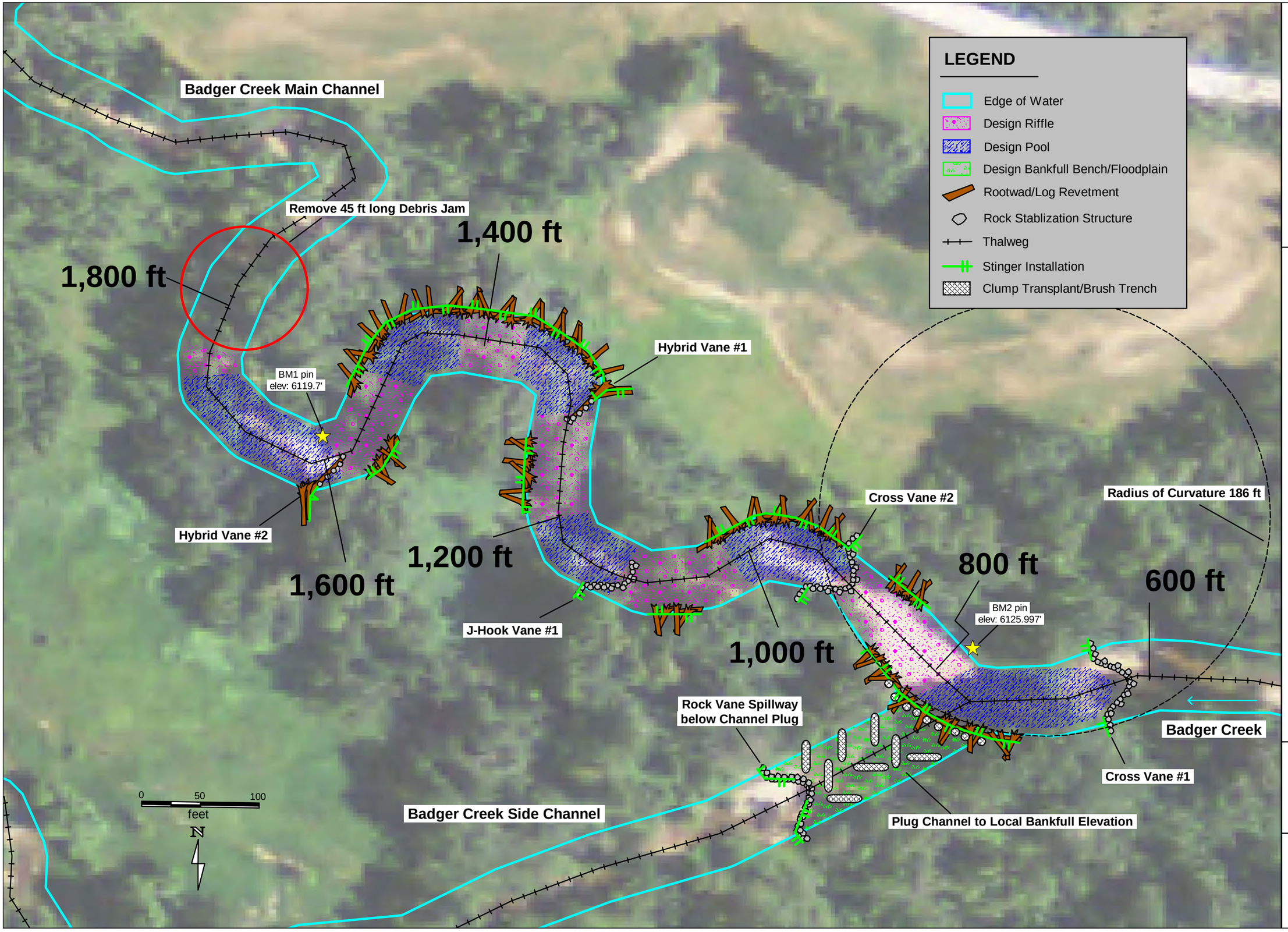
SITE PLAN INDEX

Badger Creek Restoration Project
County Road North 3000 West
Teton County, Idaho

No: 1
Date: 4/2/2013
Description: Design Drawings
Scale: 1" = 125'
2011 Aerial Photography

Drawing:

SP-1



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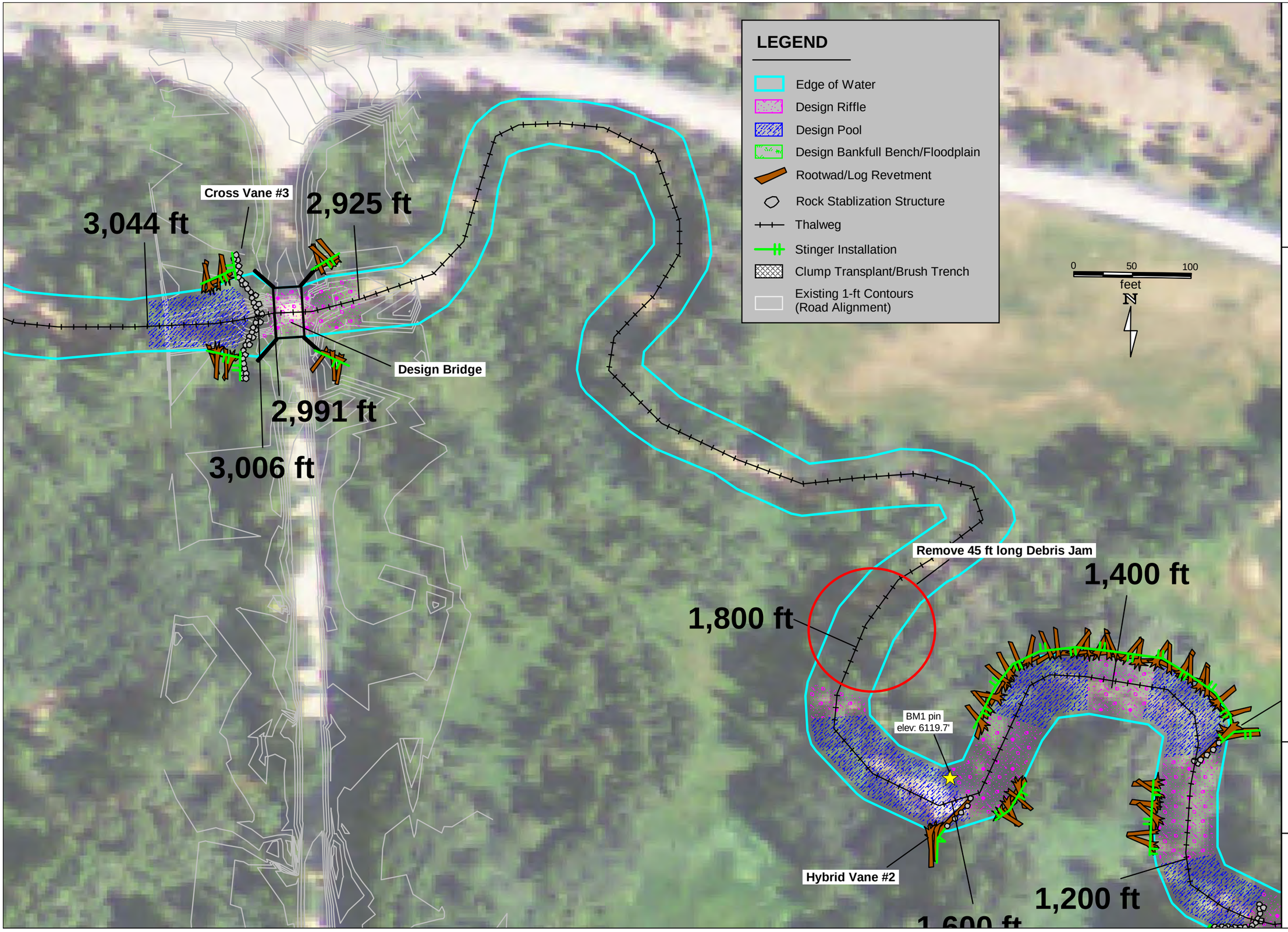
SITE PLAN
SHEET 1

Badger Creek Restoration Project
County Road North 3000 West
Teton County, Idaho

No: 1
Date: 4/2/2013
Description: Design Drawings
Scale: 1 in = 75 ft
2011 Aerial Photography

Drawing:

SP-2



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SITE PLAN
SHEET 2

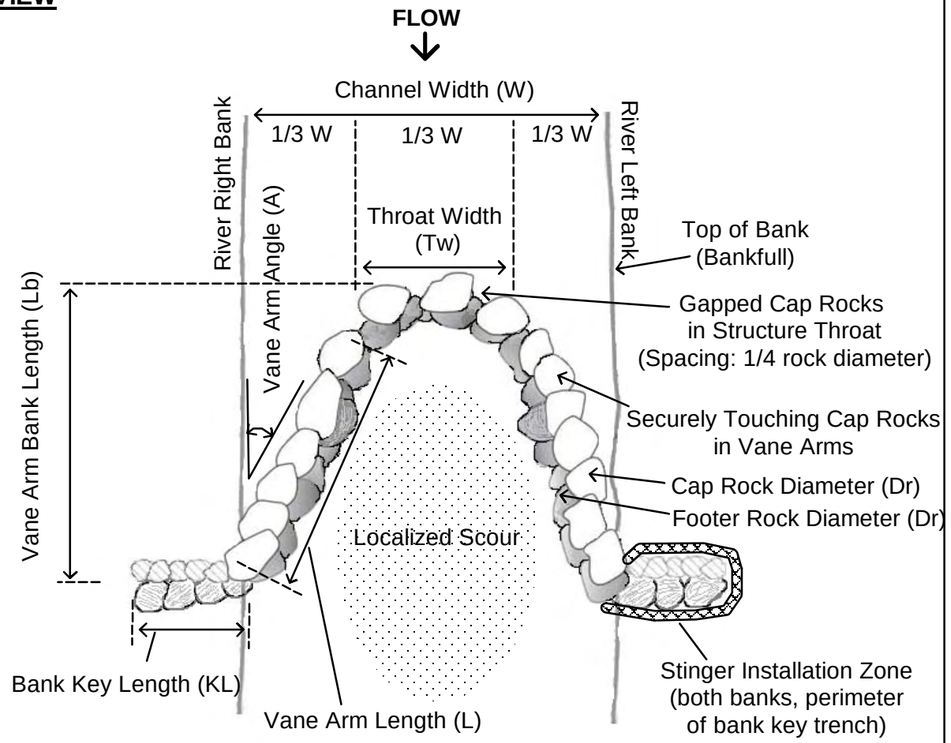
Badger Creek Restoration Project
County Road North 3000 West
Teton County, Idaho

No: 1
Date: 4/2/2013
Description: Design Drawings
Scale: 1 in = 75 ft
2011 Aerial Photography

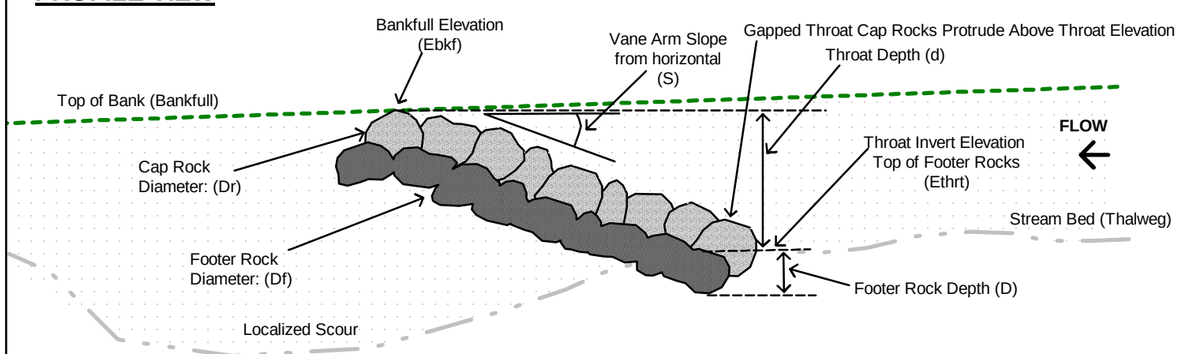
Drawing:

SP-3

PLAN VIEW



PROFILE VIEW



TREATMENT SPECIFICATIONS

Code	Description	Cross Vane 1 (upstream)	Cross Vane 2	Side Channel Spillway Vane (below plug)	Cross Vane 3 (downstream of bridge)
W	Channel Width (ft)	40	40	fit to site	43
Tw	Throat Width (ft)	13.3	13.3	20	14.3
Ethrt	Throat Invert Elevation (ft)	6123.0	6121.4	6124.4	6108.3
	Gapped Throat	yes	yes	no	yes
Ethrt2	Secondary Tier Elevation (ft)	n/a	n/a	n/a	n/a
L	Vane Arm Length (ft)	26	26	fit to site	fit to site
Lb	Vane Arm Bank Length (ft)	22	22	fit to site	fit to site
S	Vane Arm Slope (ft/ft)	0.12	0.12	fit to site	fit to site
A	Vane Arm Angle (deg)	30	30	45	fit to site
Ebkfl	Bankfull Elevation (ft)	6126.0	6124.4	6124.9	6112.1
Kl	Bank Key Length (ft)	10	10	10	10
Dr	Cap Rock Diameter (ft)	3	3	3	3
Df	Footer Rock Diameter (ft)	3	3	3	3
	3-ft Boulders Needed (cy)	57	57	65	57

Work Description:

Rock cross vane installation includes site preparations necessary to install complete structures at locations listed on sheets SP-1 through SP-3. Contractor shall install the structures as specified on sheet DT-1, unless alterations are approved by the design consultant. All materials for rock cross vane structures are identified and shall meet the specifications listed on sheet DT-1.

Dewatering may be required for structure installation. Dewatering discharge, if required, shall be directed to a settling basin approved by the design consultant. Contractor shall use BMPs as approved by design consultant.

Design consultant shall identify and mark the construction location for each rock cross vane structure prior to construction.

Contractor shall use boulders of specified dimensions as shown on sheet DT-1. Finish elevations, dimensions, and slopes shall be as specified on sheet DT-1, unless modifications are approved by the design consultant.

Vanes shall be constructed as vortex weirs; lateral spacing between adjacent cap rocks in the structure throat shall be 1/4 of the rock diameter. Lateral spacing between adjacent cap rocks in the structure arms and bank keys shall be zero.
Lateral spacing between adjacent footer rocks shall be zero; footer rocks shall be securely touching.

Locally harvested dormant woody vegetation stingers (cuttings) shall be installed at a minimum rate of 1 per foot along all bank keys. Stinger installations shall be completed as per details on Sheet DT-3.

Design consultant shall inspect materials and final elevations of the structure prior to contractor commencing construction of final channel grading and backfill.

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DETAIL SHEET -- ROCK VANES

Badger Creek Restoration Project
County Road North 3000 West
Teton County, Idaho

No: 1
Date: 4/2/2013
Description: Design Drawings

Drawing:

DT-1

PLAN VIEW

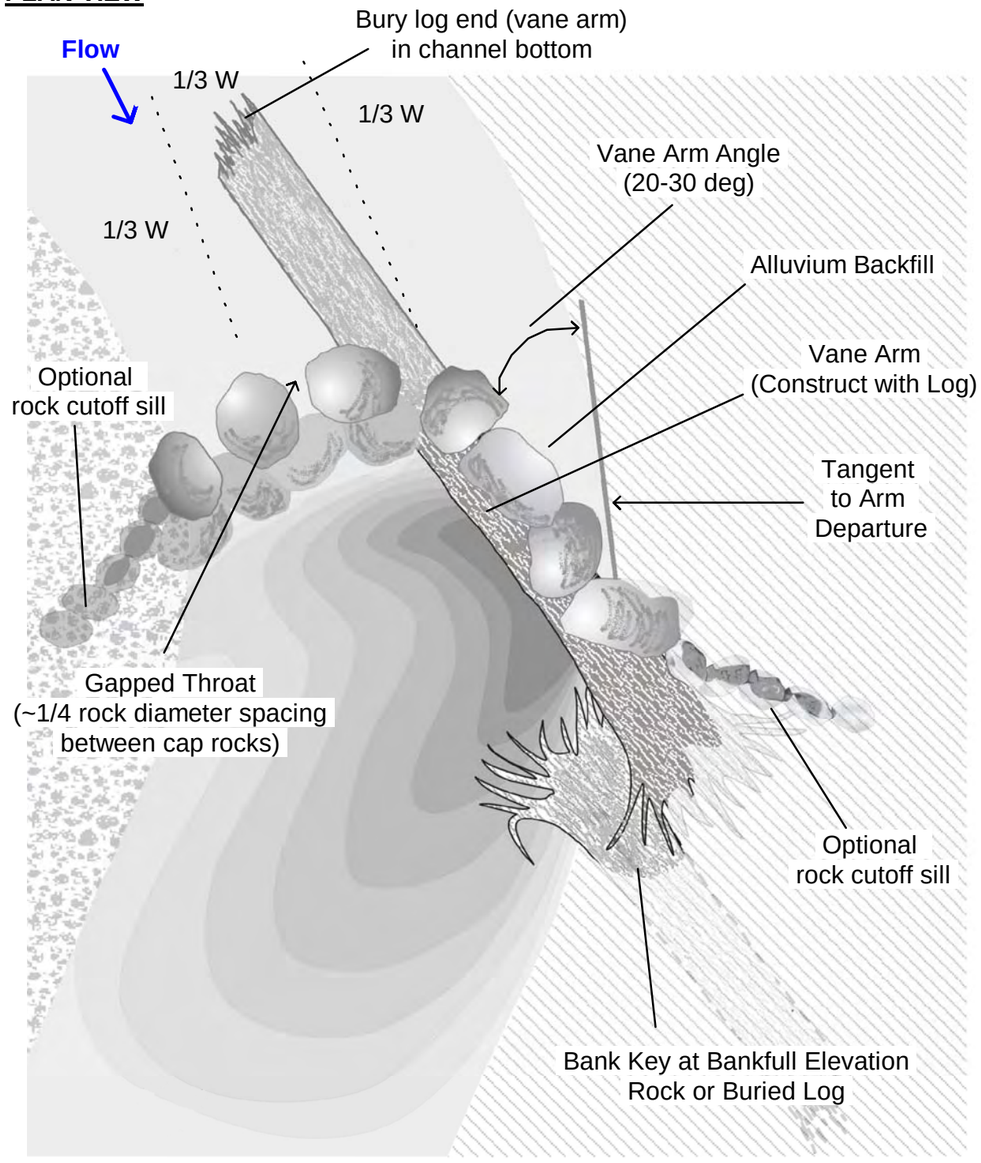
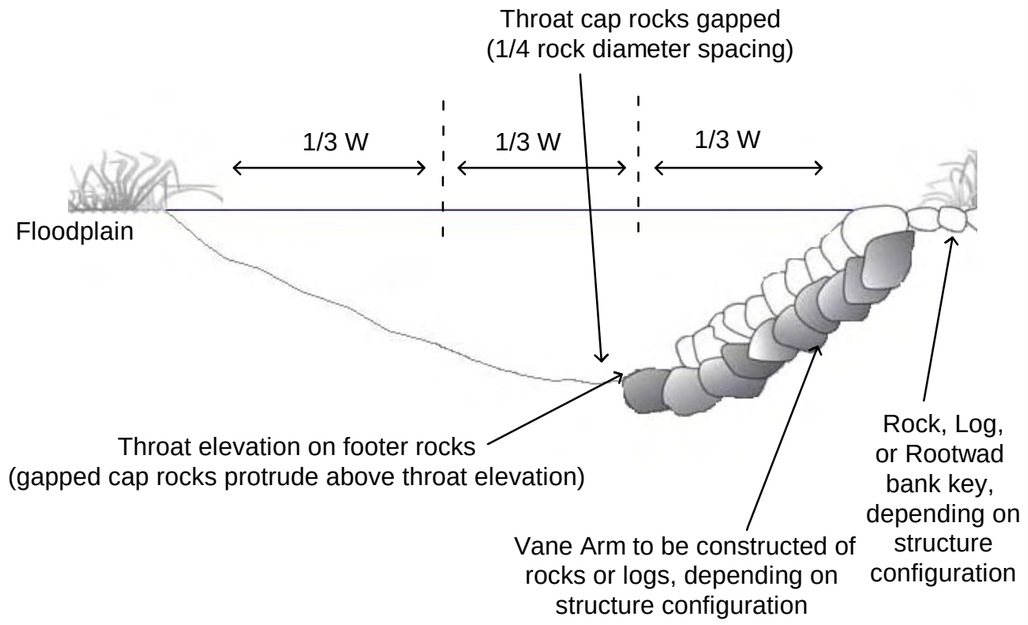


Image modified from Rosgen J-hook Structures, Wildland Hydrology, 2006.

PROFILE VIEW



Code	Description	J-Hook Vane #1	Hybrid Vane #1	Hybrid Vane #2
W	Channel Width (ft)	40	40	40
Tw	Throat Width (ft)	13.3	13.3	13.3
Ethrt	Throat Invert Elevation (ft)	6120	6118.97	6117.4
L	Vane Arm Length (ft)	26	26	26
Lb	Vane Arm Bank Length (ft)	22	22	22
S	Vane Arm Slope (ft/ft)	11.5%	11.5%	11.5%
A	Vane Arm Angle (deg)	30	30	30
Ebkfl	Bankfull Elevation (ft)	6123.0	6122.0	6120.4
Kl	Bank Key Length (ft)	10	10	10
Dr	Cap Rock Diameter (ft)	3	3	3
Df	Footer Rock Diameter (ft)	3	3	3
	3-ft Boulders Needed (cy)	33	12 + logs	12 + logs

Work Description:

Rock J-hook and hybrid vane installation includes site preparations necessary to install complete structures at locations listed on sheets SP-1 through SP-3. Contractor shall install the structures as specified on sheet DT-2, unless alterations are approved by the design consultant.
Design consultant shall identify and mark the construction location for each vane structure prior to construction.
Dewatering may be required for structure installation. Dewatering discharge, if required, shall be directed to a settling basin approved by the design consultant. Contractor shall employ BMPs as approved by design consultant.

Contractor shall use boulders of approximately 2.5-3.0 ft diameter (B-axis). Vanes will be constructed in a vortex configuration; lateral spacing between throat rocks will equal 1/4 rock diameter. Footer rocks shall not be gapped. Specified vanes shall be constructed in a hybrid configuration; vanes shall incorporate a log in the vane arm. The vane arm log shall be supported by 1 or 2 backer logs (bank key logs) as needed, and shall be supported on top of 1 or 2 root wad boles anchored into the bank to form the bank key and cutoff sill. No wood or rock structure shall protrude above the bankfull elevation.
Locally harvested dormant woody vegetation stingers (cuttings) shall be installed at a minimum rate of 1 per foot along all bank keys. Stinger installations shall be completed as per details on Sheet DT-3.
Design consultant shall inspect materials and final elevations of the structure prior to contractor commencing construction of final channel grading and backfill.

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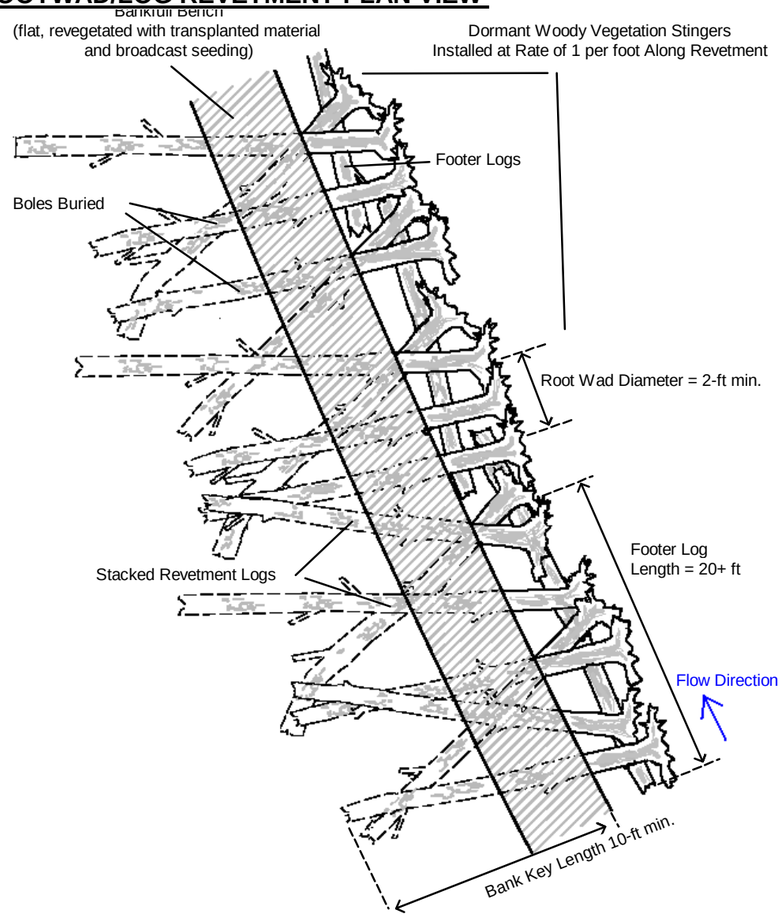
DETAIL SHEET
J-HOOK AND HYBRID VANES

Badger Creek Restoration Project
County Road North 3000 West
Teton County, Idaho

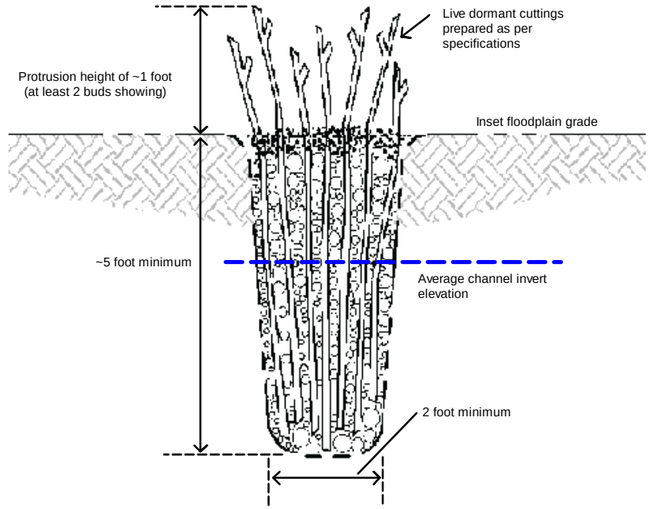
No: 1
Date: 4/2/2013
Description: Design Drawings

Drawing:
DT-2

ROOTWAD/LOG REVETMENT PLAN VIEW

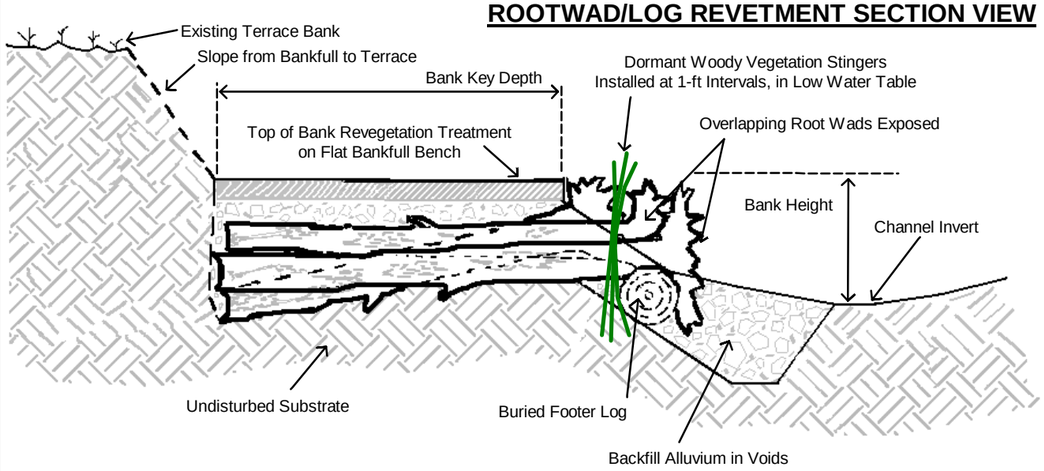


BRUSH TRENCHES



Root Wad Treatment	Specification
Length of revetment log (with rootwad or broken end)	~10 ft
Bank key length	10 ft
Footer log length	20+ ft
Footer log diameter	18 in (min.)

ROOTWAD/LOG REVETMENT SECTION VIEW



Work Description:

Rootwad/log revetment installation includes the preparatory work and operations necessary to install complete structures at locations listed on sheet SP-1 through SP-3. All materials for wood revetments are identified and shall meet the specifications listed on sheet DT-3.
Design consultant shall survey and mark the construction location for each root wad revetment structure prior to construction.
Dewatering may be required for structure installation. Dewatering discharge, if necessary, shall be directed to a settling basin approved by the design consultant. Contractor shall install BMPs as approved by design consultant.

Contractor shall excavate trench for structure and stockpile excavated alluvium for backfill.
Contractor shall install the footer logs as per specifications on sheet DT-3.

Contractor shall install the revetment logs as per orientation described on sheet DT-3.
The most upstream root wad shall not protrude into the channel and shall be flush with the bank line. Root wads shall not extend above the bankfull elevation. Contractor shall backfill up to the top of the root wad logs with stockpiled alluvium, and then compact with bucket compaction.
Exposed ends shall not be sawed; exposed ends shall include a rootwad or shall be broken.
Design consultant shall inspect materials and final elevations of structures prior to contractor commencing construction of final channel grading and backfill.

Bioengineering

Native, site-adapted willow cuttings (and cuttings of other woody species approved by the design consultant) will be used in various bioengineering treatments (e.g., vertical bundles, stingers, and revetments) throughout the project area.

Stingers/Willow Cuttings

Cuttings from willows (and other approved species) will be used in the bioengineering effort. Willows in the vicinity of the project area provide an excellent source for site-adapted cuttings. Willow cuttings should be collected in the fall after abscission (leaf-fall) or in the spring before leaf-out. Cuttings will have a minimum diameter of 3/4-inch and be comprised of wood that is at least 2 years old. Tops of the cuttings shall be painted with latex paint, bundles of cuttings shall be tied together with twine, and bundles shall be completely submerged in water for a minimum of 7 days prior to installation.

Seeding

All haul routes and stockpile areas shall be decompacted (if necessary) and reseeded with a native seed mix (to be approved by design consultant) that is appropriate based upon local hydrologic regime. The site shall be seeded by hand or with a broadcast seeder in the fall prior to the onset of winter and the presence of season-long snow cover. Seed shall not be broadcast on snow-covered ground. After seeding, the seed shall be rolled, harrowed, or lightly raked to ensure maximum seed-to-soil contact. Site specific native seed mix(es) shall be approved by the design consultant prior to project implementation.

Topsoil Salvage and Storage

Topsoil within the areas that will be excavated, severely disturbed, or compacted shall be removed and stockpiled in designated location(s). Care shall be taken not to mix subsoil with the topsoil.
Weed-infested topsoil should not be salvaged, but should instead by used as deep fill. Subsoil should be stockpiled separately and may, depending on composition, be mixed with compost and other amendments and used to make up for any topsoil shortage during revegetation efforts.

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DETAIL SHEET
ROOTWAD/LOG REVETMENTS
& BIOENGINEERING

Badger Creek Restoration Project
County Road North 3000 West
Teton County, Idaho

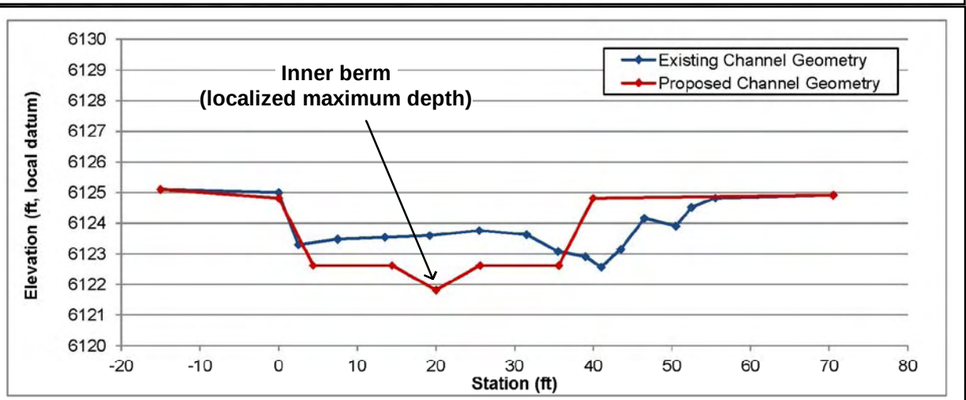
No: 1
Date: 4/2/2013
Description: Design Drawings

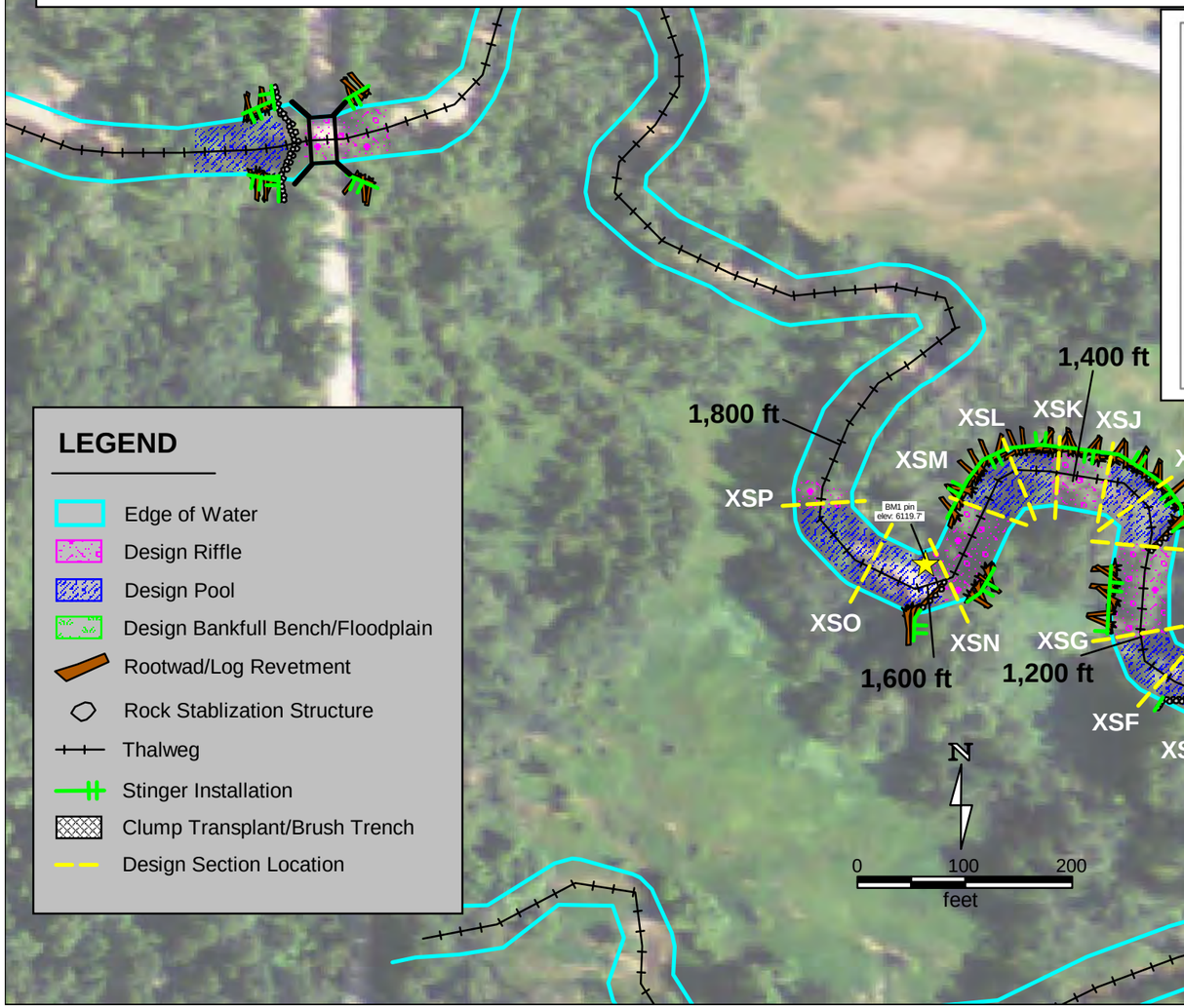
Drawing:

DT-3

XSA Riffle			XSB Riffle			XSC Pool			XSD Riffle			XSE Riffle			XSF Pool			XSG Riffle			XSH Riffle		
Bankfull Elevation:	6124.92		Bankfull elevation:	6124.37		Bankfull elevation:	6124.05		Bankfull elevation:	6123.69		Bankfull elevation:	6123.21		Bankfull elevation:	6122.95		Bankfull elevation:	6122.66		Bankfull elevation:	6122.17	
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
-15	6125.20	LB	-15	6124.65	LB	-15	6124.33	LB	-15	6123.97	LB	-15	6123.49	LB	-15	6123.23	LB	-15	6122.94	LB	-15	6122.45	LB
0	6124.92	BKFL	0	6124.37	BKFL	0	6124.05	BKFL	0	6123.69	BKFL	0	6123.21	BKFL	0	6122.95	BKFL	0	6122.66	BKFL	0	6122.17	BKFL
4.4	6122.72		4.4	6122.17		4.4	6121.85		4.4	6121.49		4.4	6121.01		4.4	6120.75		4.4	6120.46		4.4	6119.97	
14.4	6122.72		14.4	6122.17		14.4	6118.95		14.4	6121.49		14.4	6121.01		14.4	6117.85		14.4	6120.46		14.4	6119.97	
20	6121.92		20	6121.37		20	6117.45		20	6120.69		20	6120.21		20	6116.35		20	6119.66		20	6119.17	
25.6	6122.72		25.6	6122.17		25.6	6118.95		25.6	6121.49		25.6	6121.01		25.6	6117.85		25.6	6120.46		25.6	6119.97	
35.6	6122.72		35.6	6122.17		35.6	6121.85		35.6	6121.49		35.6	6121.01		35.6	6120.75		35.6	6120.46		35.6	6119.97	
40	6124.92	BKFL	40	6124.37	BKFL	40	6124.05	BKFL	40	6123.69	BKFL	40	6123.21	BKFL	40	6122.95	BKFL	40	6122.66	BKFL	40	6122.17	BKFL
55	6125.22	RB	55	6124.67	RB	55	6124.35	RB	55	6123.99	RB	55	6123.51	RB	55	6123.25	RB	55	6122.96	RB	55	6122.47	RB

XSI Pool			XSJ Riffle			XSK Riffle			XSL Pool			XSM Riffle			XSN Riffle			XSO Pool			XSP Riffle		
Bankfull elevation:	6121.89		Bankfull elevation:	6121.68		Bankfull elevation:	6121.41		Bankfull elevation:	6121.19		Bankfull elevation:	6120.91		Bankfull elevation:	6120.47		Bankfull elevation:	6120.01		Bankfull elevation:	6119.55	
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
-15	6122.17	LB	-15	6121.96	LB	-15.00	6121.69	LB	-15	6121.47	LB	-15	6121.19	LB	-15	6120.75	LB	-15	6120.29	LB	-15	6119.83	LB
0	6121.89	BKFL	0	6121.68	BKFL	0.00	6121.41	BKFL	0	6121.19	BKFL	0	6120.91	BKFL	0	6120.47	BKFL	0	6120.01	BKFL	0	6119.55	BKFL
4.4	6119.69		4.4	6119.48		4.40	6119.21		4.4	6118.99		4.4	6118.71		4.4	6118.27		4.4	6117.81		4.4	6117.35	
14.4	6116.79		14.4	6119.48		14.40	6119.21		14.4	6116.09		14.4	6118.71		14.4	6118.27		14.4	6114.91		14.4	6117.35	
20	6115.29		20	6118.68		20.00	6118.41		20	6114.59		20	6117.91		20	6117.47		20	6113.41		20	6116.55	
25.6	6116.79		25.6	6119.48		25.60	6119.21		25.6	6116.09		25.6	6118.71		25.6	6118.27		25.6	6114.91		25.6	6117.35	
35.6	6119.69		35.6	6119.48		35.60	6119.21		35.6	6118.99		35.6	6118.71		35.6	6118.27		35.6	6117.81		35.6	6117.35	
40	6121.89	BKFL	40	6121.68	BKFL	40.00	6121.41		40	6121.19		40	6120.91		40	6120.47		40	6120.01		40	6119.55	
55	6122.19	RB	55	6121.98	RB	55.00	6121.71		55	6121.49		55	6121.21		55	6120.77		55	6120.31		55	6119.85	





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DESIGN CHANNEL DIMENSIONS

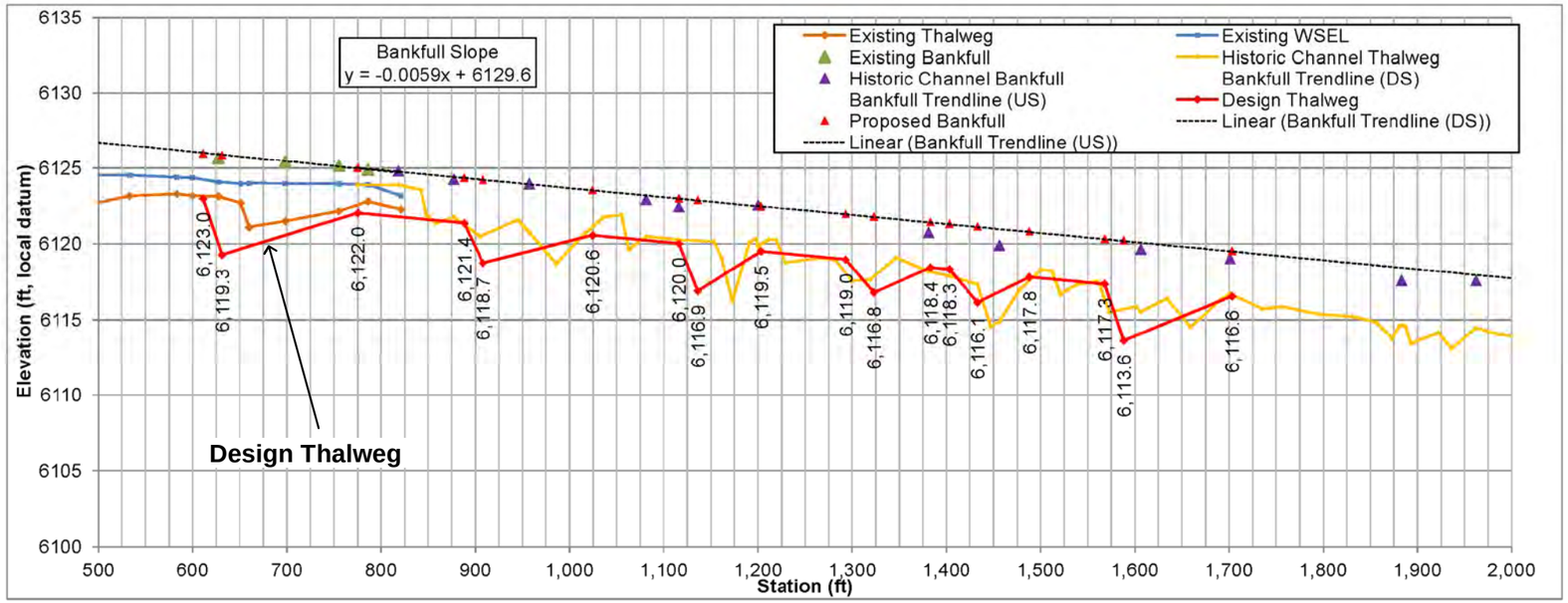
Badger Creek Restoration Project
County Road North 3000 West
Teton County, Idaho

No: 1
Date: 4/2/2013
Description: Design Drawings

Drawing:

DT-4

LONG PROFILE



1,800 ft

1,400 ft

1,200 ft

1,600 ft

1,000 ft

800 ft

600 ft

BM1 pin
elev: 6119.7'

BM2 pin
elev: 6125.997'

LEGEND

- Edge of Water
- Design Riffle
- Design Pool
- Design Bankfull Bench/Floodplain
- Rootwad/Log Revetment
- Rock Stablization Structure
- Thalweg
- Stinger Installation
- Clump Transplant/Brush Trench

N

0 100 200
feet

Badger Creek

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DESIGN CHANNEL PROFILE
SHEET 1

Badger Creek Restoration Project
County Road North 3000 West
Teton County, Idaho

No: 1
Date: 4/2/2013
Description: Design Drawings
Scale: 1" = 100'
2011 Aerial Photography

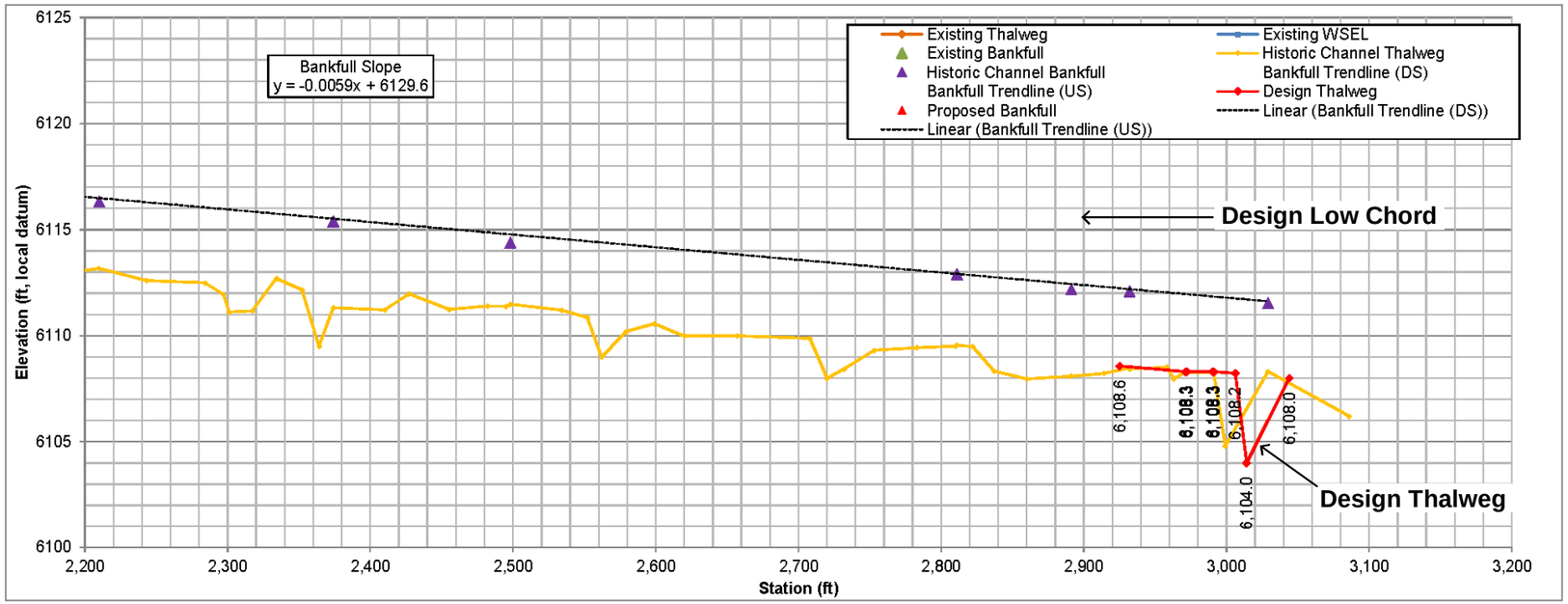
Drawing:

DT-5

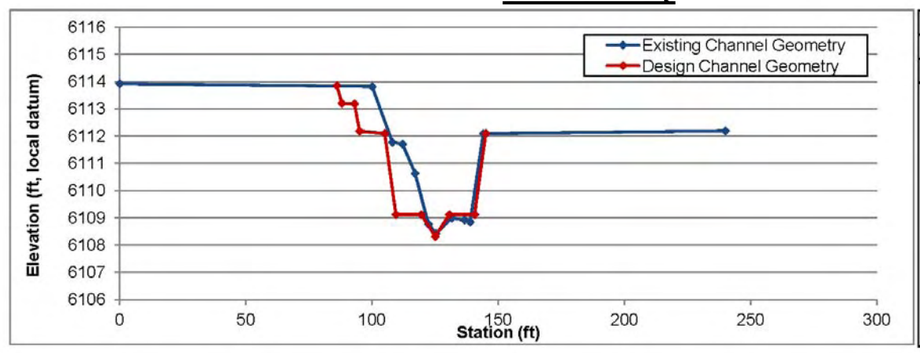
LEGEND

- Edge of Water
- Design Riffle
- Design Pool
- Design Bankfull Bench/Floodplain
- Rootwad/Log Revetment
- Rock Stablization Structure
- Thalweg
- Stinger Installation
- Clump Transplant/Brush Trench

LONG PROFILE



SECTION XSQ



XSQ Riffle	
Bankfull elevation:	6121.69
Station	Elevation Notes
86.00	6113.85
88.00	6113.20
93.00	6113.18
95.00	6112.18
105.00	6112.09 BKFL
109.40	6109.12
119.40	6109.12
125.00	6108.32
130.60	6109.12
140.6	6109.12
145	6112.09 BKFL

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DESIGN CHANNEL PROFILE
SHEET 2

Badger Creek Restoration Project
County Road North 3000 West
Teton County, Idaho

No: 1
Date: 4/2/2013
Description: Design Drawings
Scale: 1" = 100'
2011 Aerial Photograph

Drawing:

DT-6